PUBLIC WORKS

Aug. 1959

CITY, COUNTY AND STATE

70 Miles of TRUNK SEWERS FOR County Sanitary Districts page 93

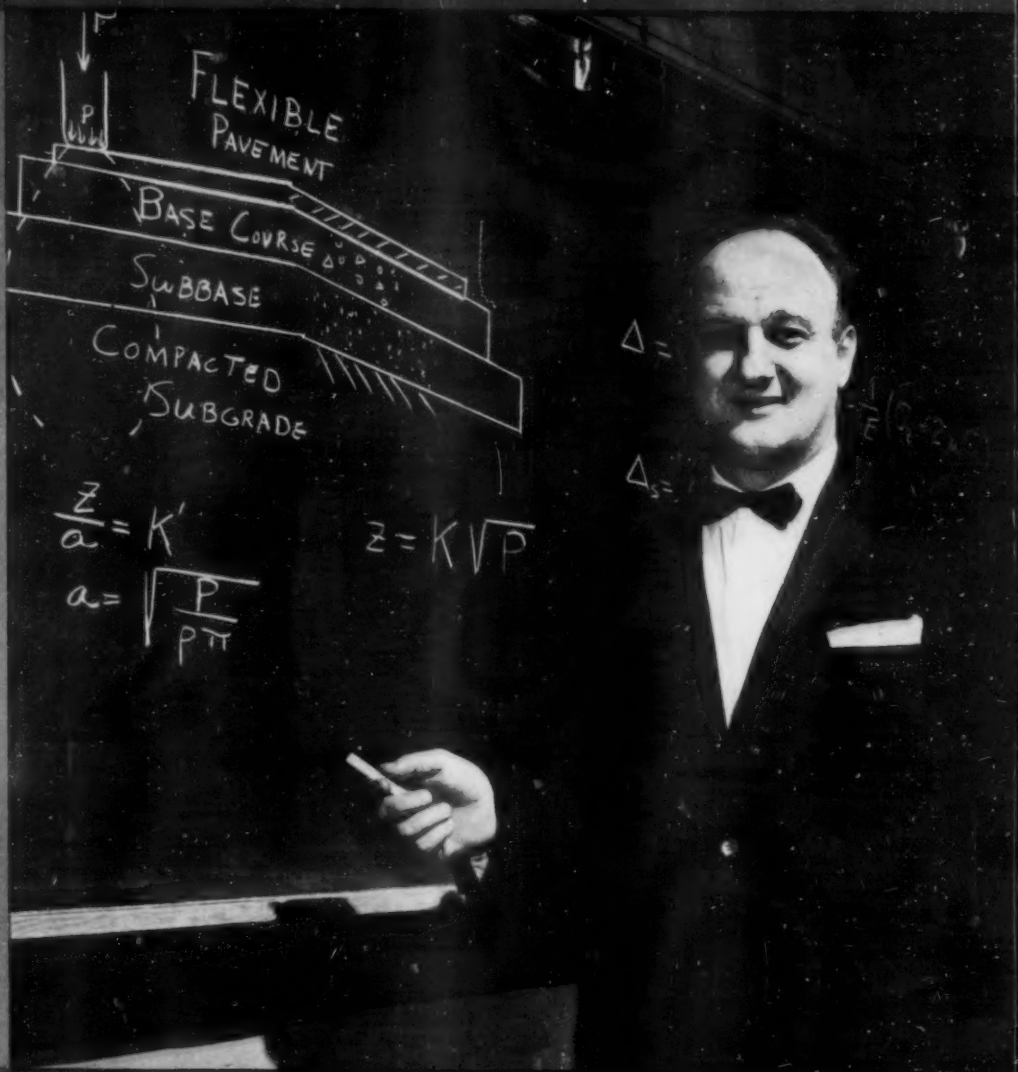
NOW AND ICE CONTROL at Township, City, County, State and Toll Road Levels pages 98 to 107 and pages 114 to 119

Major City's Approach to TRAFFIC PLANNING page 110

SLUDGE HANDLING at Ten Sewage Plants page 120

HOW A SUBDIVISION Organized and Financed a Water District and System page 125

COMPLETE CONTENTS LISTED ON PAGE 5



Professor E. J. Yoder is chief of the Soils Laboratory of the Joint Highway Research Project at Purdue University. Also he is in charge of teaching Pavement and Airport Design at Purdue. More on page 33.

Knight on a shining white Chlorinator...

I thought my days of glory were ended!

For years I charged around the countryside purifying wells with Merlin's Magic Salts. People paid me fortunes in gold and silver. Furthermore . . . sometimes my magic *worked*.

Then, suddenly, my gravy train slowed down. Wherever I travelled, I saw slick looking boxes popping up beside sick looking wells. They were every color of the rainbow. Polluted water was fast becoming a part of the past. So was I! Then, one day, I saw a stranger in the act of installing one of these weird boxes.

I ambushed him. Asked him what he thought he was doing . . . ruining an honest Knight's work. And he had the gall to tell me that he was selling Fischer & Porter Chlorinators. CHLORINATORS! I laughed and laughed. "Don't you know that chlorine is impossible to control . . . that it eats up everything in sight?" And with that I turned back to my white charger.

WHANG! Before I could mount, he pinned me to the ground with a stock model. Then he told me all about stacked diaphragm regulators, corrosion-proof materials, even built-in flowmeters. What could I do? I did the only thing possible. *I bought one.* Traded off my trusty steed for it. Whew . . . what a salesman.

So I don't have a horse anymore. And my old business is all washed up. But I don't care. I'm doing just fine charging a nickel a glass for the purest, safest drinking water in the Belgian Congo. If you're in the market, drop by. Or, get your own *safe water by writing Fischer & Porter Company, 589 Fischer Road, Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Toronto, Canada.*

FP FISCHER & PORTER COMPANY *Instrumentation and Chlorination*

THE ONLY
SLUDGE DIGESTION SYSTEM
PROVIDING
HIGH SOLIDS LOADING...
verified performance...
maximum operating flexibility

Accelerated
CRP*
Sludge Digestion
System

*Trademark

47 operating and specified installations of the CRP* System with "Chicago" gas mixing equipment, since 1953, prove its unparalleled acceptance . . . serving cities from 2,000 to 250,000 population.

Savings

1. A 2/3 reduction in new tank volume requirements.
2. Simplified plant operation due to sludge homogeneity through continuous gas mixing.

Performance

1. Produces required biological reduction of solids in 1/3 to 1/7 tank capacity.
2. Maximum quantity of gas produced at higher rates.
3. Complete absence of digester scum through continuous gas mixing.

INFORMATION IS AVAILABLE to Consulting Engineers from Chicago Pump Company or its Distributors . . . pertaining to the application of this system and availability of licenses for its use in existing or new digesters designed for present or future maximum digester loadings.

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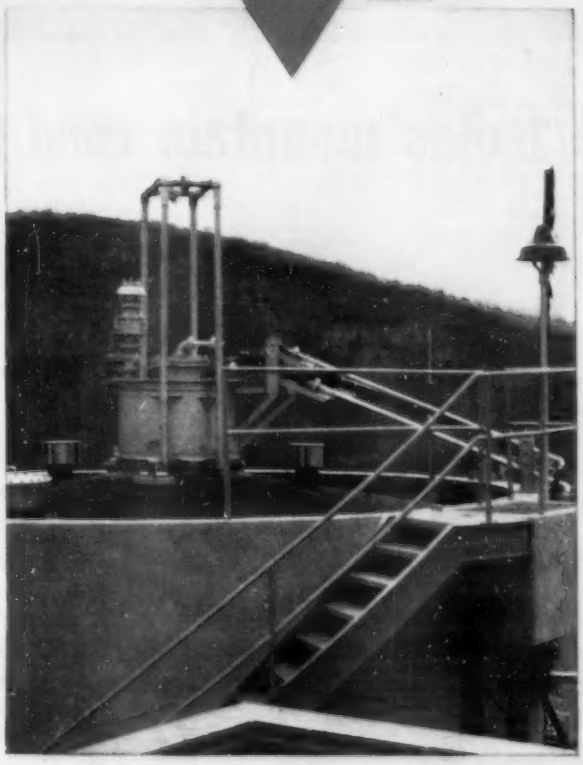
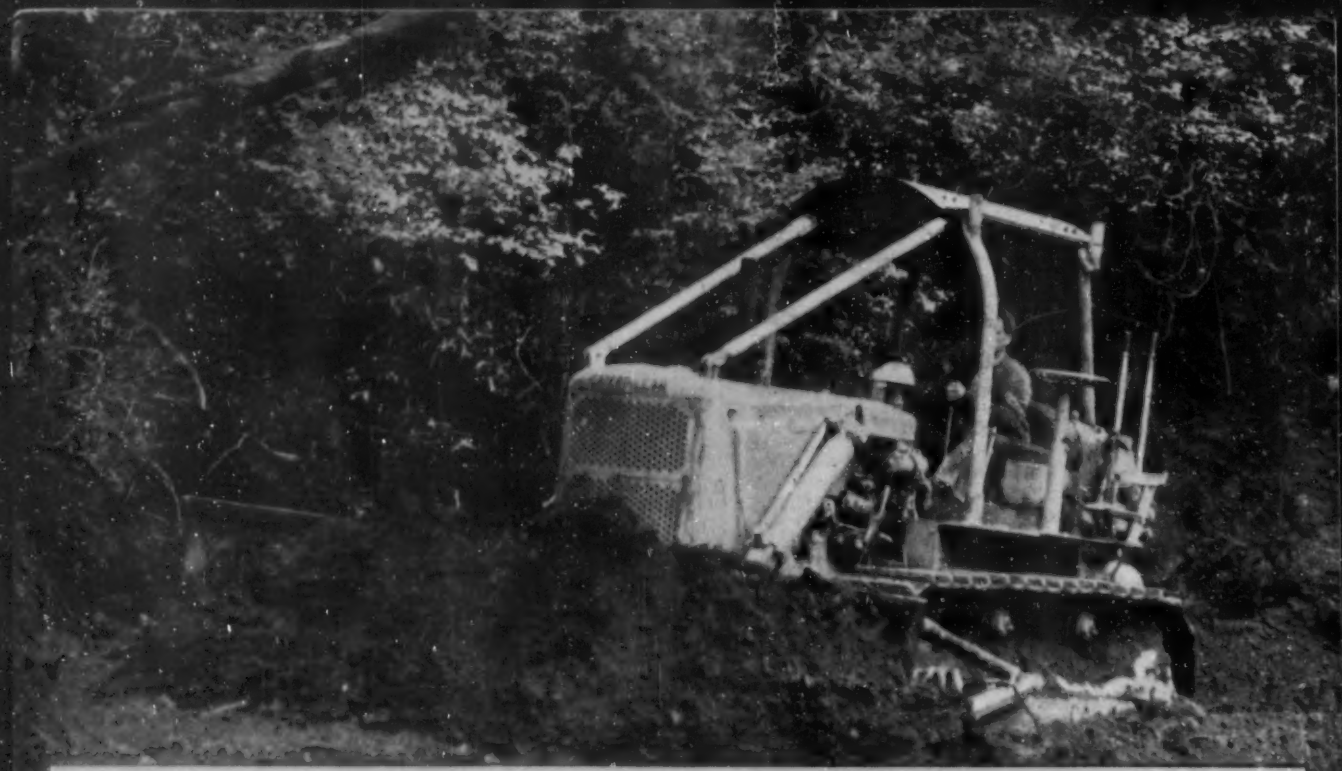


20 ft. dia. digester serving 6000 population . . . Redee, California . . . Engineer—M. Carleton Yoder

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
Chicago Pump Company
622 F DIVERSEY PARKWAY · CHICAGO 14, ILLINOIS

1909 50 YEARS 1959 CHICAGO PUMP COMPANY



D6 builds mountain road to Portland Reservoir

Portland, Oregon, gets its supply of pure, soft mountain water from the Bull Run River . . . 30 miles east of the city. The river has its source in Bull Run Lake near the summit of the Cascades . . . elevation 3,175 feet. The uninhabited, 218-square-mile area is heavily-timbered, rugged terrain. To repair a dam at Bull Run Lake required carving out 5 miles of new road.

A Caterpillar D6 Tractor with a No. 6A Bulldozer and a Hyster donkey did the job . . . rough grading, ditching, clearing boulders, skidding logs, spreading crushed rock. All this plus general maintenance jobs such as winching logs from the lake and river.

The versatile D6 outworks any tractor in its size range. It combines high production with low operating and maintenance costs.

The 93 horsepower Caterpillar Engine delivers the push and pull to make the hard work easy; the engine's foul-proof fuel system runs on economy-type diesel fuels.

The D6 is fast . . . speeds up to 6.6 MPH . . . and easy to operate. A hydraulic unit takes the effort out of steering, helps the operator work at top efficiency.

The exclusive Caterpillar oil clutch goes up to 2,000 hours—one whole season—without adjustment. When other type clutches need *replacing*, a Caterpillar oil clutch may need an *adjustment*.

All of these factors on the D6 combine to give you maximum return on every tax dollar invested. And remember, the trade-in value on Cat machines is tops. A demonstration on your job will show you why the D6 is the work horse of so many cities, townships and counties. Call your Caterpillar Dealer soon. He'll give you the complete story. And he offers complete service, genuine parts you can trust . . . everything you need to keep your equipment in top condition.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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HIGH-QUALITY MACHINES WITH A LOW FINAL COST

PUBLIC WORKS

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

August 1959 • Volume 90, Number 8

70 Miles of Trunk Sewers for Sanitation Districts 93
Three sanitation districts in fast growing Orange County, California, are installing a system that will serve until the year 2000. LEE M. NELSON

Filter Hydraulics Affect Clear Well Design 96
Study of clear well and wash water troughs to allow filter operation at peak rates provides design criteria. FRANK G. HONEYCUTT, JR.

Light Snowfalls and Ice Cause Our Winter Problems .. 98
Rural counties need modern equipment and methods for winter maintenance even though the snowfall may be relatively light. NORTH H. NEWTON

Training and Organization Prepare for Rapid Change of Weather 100
Weather is difficult to predict in Portland, Oregon, so the city must be prepared for nearly any eventuality. JOHN F. WINTER

Winter Operations on Connecticut Highways 104
With snow and ice operations accounting for 30 percent of the Department's total roadway maintenance costs, the aim is to give aid to the greatest number of winter travelers. J. W. MAHER

Pneumatic Power Speeds Construction of a Water Tunnel 108
Four-mile tunnel will carry raw water from the Detroit River to Wayne County, Michigan.

Pittsburgh's Approach to Traffic Planning 110
Changing traffic patterns, brought about by new population trends and land use, require constant improvement of traffic systems. M. J. GITTENS

Safety Practices at Sanitary Landfills 113
A review of the hazards associated with landfill operations, and the means for protecting personnel and equipment. LEROY W. VAN KLEECK

Toll Highway Needs Effective Snow and Ice Control .. 114
Accident-free travel in winter months depends on a considerable force of well-trained men and effective equipment. W. B. GETCHELL, JR.

Snow and Ice Control at the Township Level 117
A cooperative weather warning system and maximum utilization of relatively limited equipment are the keys to winter maintenance in this Pennsylvania township. WILLIAM A. SOMMERS

Sludge Utilization and Disposal 120
Experience with sludge handling at ten recently constructed sewage treatment plants in Tennessee. JULIAN R. FLEMING

New Era Opens for Roadside Parks 123
The popularity of roadside rest and park areas is inspiring more numerous and better equipped facilities for the traveler on state highways and the Interstate system. JACK M. WERTS

In Water Plants . . . How Small is Small? 125
How a subdivision with an assessed valuation of only $57,000 managed to organize a water district and to finance a water system. V. A. VASEEN

Trunk Sewer Project Starts a $100 Million System 127
A report on one of the first major sewer projects in which an epoxy formulation was used as a protective coating for pipe interiors. C. E. WRIGHT

Tractor Used on Landfill Doubles for Other City Work 129
Two and a half years' experience has shown that rubber tires need not suffer severely on landfill operations. JOHN H. KENNAUGH

Three New Pools Complete 13-Acre Park Development 130
An unused piece of wasteland in the heart of a suburban community was transformed into a recreational center for 10,000 families.

Control of Canning Waste Oxidation Ponds 133
Citrus and vegetable canning wastes have special disposal problems. N. E. DAVIS

Consulting Firm Speeds Documents with Copy Machine 135

Metal Jetties Save Money on Beach Protection 148
Details on installation methods. T. M. REED

PUBLIC WORKS DIGESTS:

Sewerage and Refuse 150
Highways and Airports 164
Water Works 182
Industrial Wastes 198

EDITORIAL DEPARTMENT

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DEPARTMENTS AND SECTIONS:

The Editor's Page 7
Leader in Public Works .. 22
Books in Brief 28
Reviews of Catalogs 36
Commentary on Water and Sewage Treatment 52
Legal Notes 78
Letters to Editor 86
APWA News Bulletins 137
Municipal Power 210
Equipment News 221
News of Engineers 227
Worth Seeing 229
Worth Telling 230

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WALKER PROCESS PACKAGE PLANTS

UNIT DESIGNS FOR SMALL SEWAGE TREATMENT PLANTS

SIMPLE OPERATION — 90% automatic
ODOR FREE — no septic or stale operations
ADAPTABLE — concrete or steel tank construction

Details and preliminary plans are available to Consulting Engineers and their Architects, concerned with the design of small communities, subdivisions, institutions, schools, etc.

SPARJAIR Unit installed at a large Florida motel to handle 25,000 gpd combined sanitary and restaurant wastes. Note proximity of plant to motor court. Odor-free operation eliminates need of isolating plant.

SPARJAIR UNIT — Nested Contact Stabilization Plant — an easy to operate, low cost, small sewage treatment plant that is a model of simplicity. Designed on a new but proven principle, the contact stabilization process aerates and thoroughly oxidizes all odors in the sewage and overcomes previous objections to locating a plant near residences, shopping areas, schools, etc. Raw sewage settling tanks and septic digesters are eliminated. This plant utilizes a separate chamber for complete aerobic digestion (42% volatile remaining) of excess sludge.

Simple operation with minimum moving parts requires only part time attention. Capacities from 50 to 5000 population equivalent.

AEROBURN PLANTS — Package Aerobic Digestion; 24-hr. "Wet Burn" Aeration— designed for installations where economy is a prime factor and clarity of plant effluent is not vital. As with SPARJAIR units, the operation is odor free and practically automatic; with no delicate biological balances to achieve and hold.

Four standard sizes at 50, 100, 150 and 200 population equivalent.

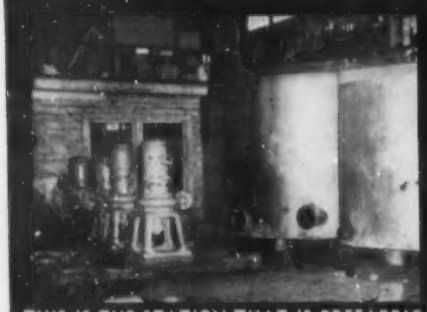
SPARJPAC — Package Trickling Filter Plants — combines trickling filter and "wet burning" digestion in a two-story, compact design to provide best features of each type of treatment. SPARJPAC plants utilize DOWPAC® trickling filter media, developed by The Dow Chemical Company.

Design capacities range from 50 to 2500 population equivalent.

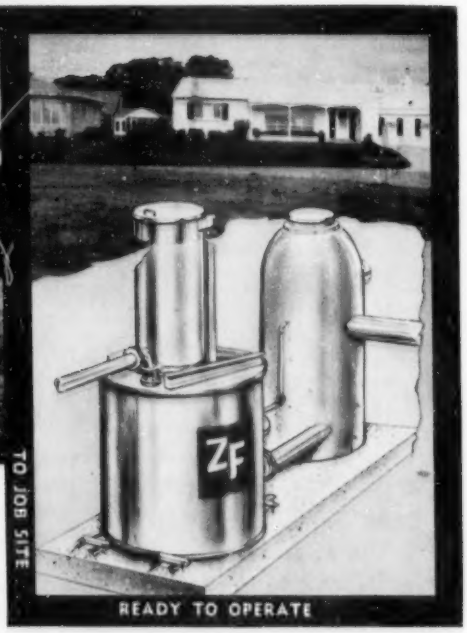
(DOWPAC is a registered trademark of The Dow Chemical Company).

WALKER PROCESS EQUIPMENT INC. factory • laboratories engineering offices **AURORA, ILLINOIS**

ZF PREFABRICATED PUMPING STATIONS



THIS IS THE STATION THAT IS PREFABRICATED . . . AND DELIVERED



TO JOB SITE

READY TO OPERATE

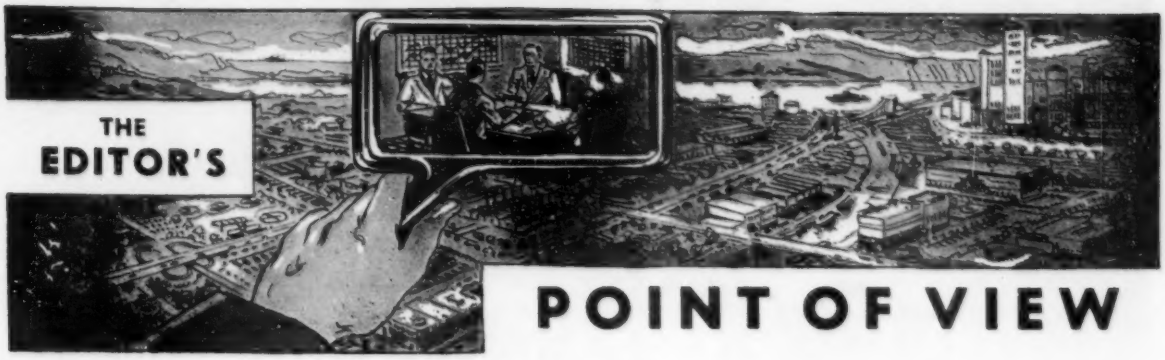
A PACKAGED UNIT—completely shop-fitted with quality components throughout. Transported to job site ready for installation.

SIMPLIFIES LOCATION—underground operation permits use of existing public property such as parkways, etc. Saves cost of surface property and enclosing structure.

ECONOMICAL—saves costs and time. Prefabrication results in lower construction costs and less time at job site. Simply set in place, connect and start up.

COMPLETE DATA, SPECIFICATIONS AND DRAWINGS AVAILABLE—WRITE

ZF ZIMMER & FRANCESCON P.O. BOX 359, MOLINE, ILLINOIS



THE EDITOR'S POINT OF VIEW

Operation Water Works Advancement

THE LONG needed program to encourage water works departments to construct equally long-needed improvements to insure consumers will have enough water in the coming years is bearing some fruit. As a result, this magazine (and no doubt others) is getting more articles from the public relations departments of the various manufacturers. This is all to the good in so far as it contributes to a better understanding by communities of their responsibility to their consumers—the responsibility to produce an ample supply of safe and palatable water at all times.

This magazine welcomes such articles; it does wish that fewer of them would depreciate and slur competing products. Of course, our editors delete such material. Unfortunately after they have done this, there isn't much left of too many of the articles.

There is always a warm welcome for a straightforward article that tells its story clearly and that will encourage and help water works engineers and superintendents to do their difficult and often thankless jobs better.

Two Other Factors of Importance in Composting Refuse

COMPOSTING REFUSE has promise for the future and the present status of technical knowledge regarding it is probably ample for normal operations. There are two other factors, however, which are just as important in ultimate success as is the formula or method used. One of these is material handling. Actually, this is the basic problem. In one way or another, efficient handling of very large volumes of bulky and objectionable refuse must be provided. At 2 pounds per person per day, 100 tons of material must be handled daily in a city of 100,000 population. This will amount to possibly 500 cubic yards—not a large amount, compared to earth-moving jobs, but enough to demand efficient handling, which means use of equipment. The other need is salesmanship. There is little use in producing compost if it piles up at the compost plant and eventually has to be hauled away at taxpayer expense.

When the material handling problem has been solved and a sound selling program developed, composting may move ahead. It has the advantage of promising profits. Gold from garbage may never be practicable, but the idea has a charm.

Four-Lane Highways and Water and Sewer Line Crossings

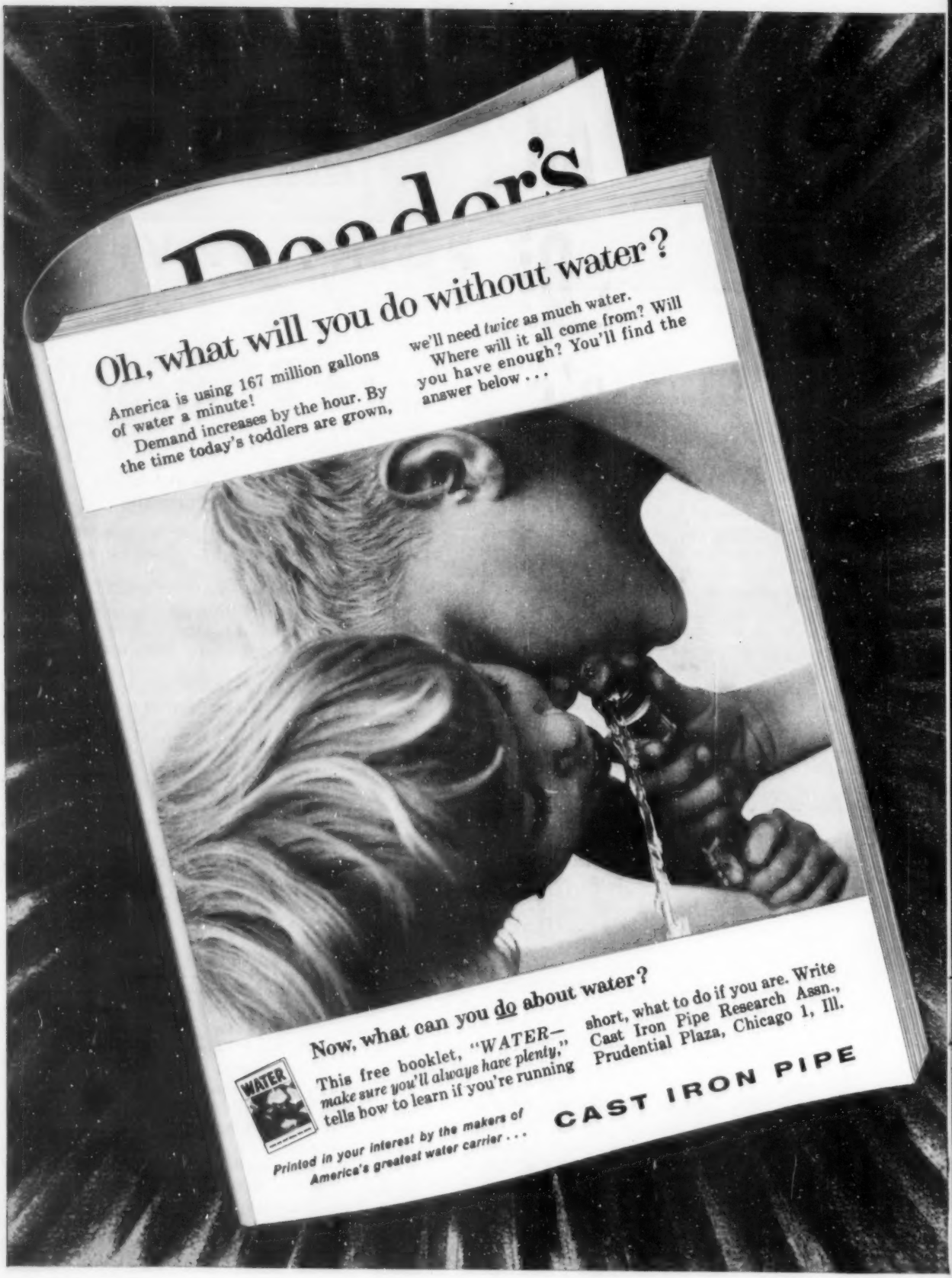
THE FINE system of four-lane highways now being constructed can create problems for sanitary engineers in addition to those involved in raising, lowering and moving water and sewer lines during construction. The additional problems can arise from the considerable difficulty that will be encountered in constructing future utility lines across the wide rights-of-way.

It has been predicted that the four-lane highways will result in strip development. If this development occurs on both sides of the high-speed highway, there can be exceeding difficulty in carrying water and sewer lines under the right-of-way; and the cost will be great. The result can well be a superfluity of dead ends and separate systems.

We think it is a good time for the State and Federal agencies responsible for the Interstate and other four-lane highway programs to consider this matter. How will necessary crossings be made, what equipment can be used and what procedures and standards must be followed?

Keeping Airport Runways and Service Areas Clean

A MODERN AIRPORT has a surface area equal to many miles of streets or highways. The cleaning problem is complicated by the increasing number of aircraft which are taking off or landing. Even now these takeoffs and landings combined will aggregate 500 or 600 per 24-hour day on our busier fields. This means one every 2½ to 3 minutes; and it doesn't leave much time for clean-up. If air traffic increases, as there is every reason to expect that it will, the situation will become increasingly difficult. The best designed, faster and more efficient cleaning equipment will be essential and that now available must be improved and developed constantly if it is to meet the increasing needs of the future.


Oh, what will you do without water?
America is using 167 million gallons of water a minute!
Demand increases by the hour. By the time today's toddlers are grown, we'll need *twice* as much water.
Where will it all come from? Will you have enough? You'll find the answer below . . .
Now, what can you do about water?
This free booklet, "WATER—*make sure you'll always have plenty,*" tells how to learn if you're running short, what to do if you are. Write Cast Iron Pipe Research Assn., Prudential Plaza, Chicago 1, Ill.
WATER
Printed in your interest by the makers of America's greatest water carrier . . .
CAST IRON PIPE

New Ad Campaign in Reader's Digest Dramatizes America's Water Problem

Cast Iron Pipe Research Association promotes better understanding of water supply and distribution problems

Offers Informative Booklet for Step-by-Step Action at the Local Level

Here's help for you and everyone else directly concerned with the supply, treatment and distribution of water—help that will acquaint the people in your town with the vital importance of this growing problem.

On the opposite page you see the first in a series of advertisements, this one appearing in February *Reader's Digest*. Placed by the Cast Iron Pipe Research Association, these striking advertisements point out to Mr. and Mrs. America how much we depend on a good water system and why we can no longer take it for granted.

Similar advertising will appear regularly this year in *U. S. News & World Report, Nation's Business, Better Homes & Gardens, American Home* and *Sunset* magazines to carry this public service message to millions of community leaders and homeowners.

Free Local Plan-of-Action Booklet

These ads offer a free booklet telling about the water problem. It shows how responsible citizens can acquaint themselves with the needs of their community. It also gives a step-by-step outline of action, telling how they can help their officials extend and improve the local water system through more adequate rate structures or financing.

We'll be happy to send you a free copy of this new booklet. Write to Thos. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Ill.

THREE REASONS WHY CAST IRON PIPE IS *AMERICA'S GREATEST WATER CARRIER:*

1. More miles of underground cast iron water mains are now in use than of all other kinds of pipe combined.

2. More miles of cast iron water mains are now being purchased and laid than of any other kind of pipe.

3. Impartial surveys prove that today's water utility officials and consulting engineers prefer cast iron pipe for underground water distribution by an overwhelming majority.

CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

Cleans up to 120 feet of sludge bed per hour

Mechanical cleaner provides faster and more efficient sludge removal than conventional hand cleaning methods

Here's a mechanized method of cleaning sludge beds that will pay for itself in a relatively short time. While individual savings depend on such variables as size of plant, available manpower, method of disposal, etc., annual savings of 60% have been reported over conventional hand cleaning.

The sludge bed cleaner offered by Link-Belt is essentially a conveyor system on wheels . . . the system is mounted on a standard tractor, which travels on concrete runways in sand beds and cleans a path up to 26 feet in width. Performance-proven Link-Belt conveying and power transmission components are combined into an efficient mechanism that is operated by hydraulic motors.

The cleaning cycle works like this. Forked scoops assure minimum loss of filter bed sand. The scoops are raised alternately, elevating the sludge and chuting it over a front truss. Sludge is conveyed by two wing conveyors into a trough where it is pushed along by a center longitudinal flight conveyor. This conveyor carries the sludge up a 45° incline where it is deposited in a truck that is towed or driven behind the tractor.

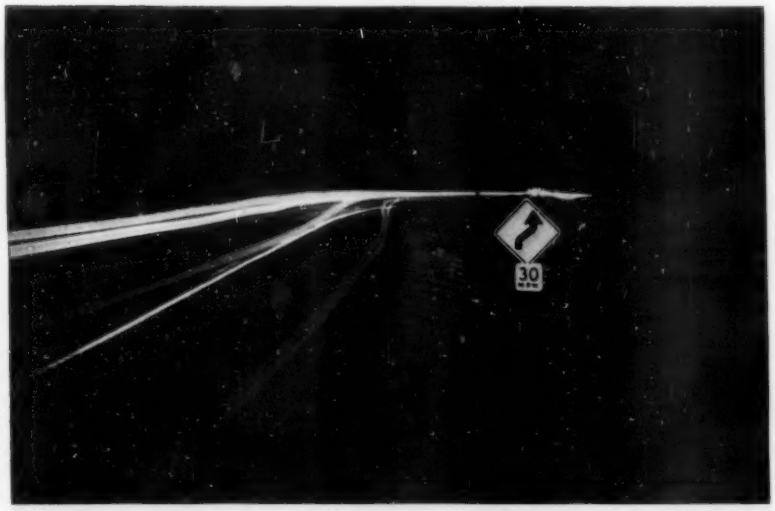
For more detailed information on how you can clean sludge beds faster, more efficiently, call your nearest Link-Belt office. Send for Folder No. 2671.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World. 14.902

Why over 700 cities and counties get better signing at lower cost



With a vacuum applicator in your sign shop, you can make all types of professional traffic signs for roads and streets—reflective signs that guide motorists safely and surely day and night.

Fabrication of professional traffic signs with an automatic vacuum applicator is the method now in use by over seven hundred cities and counties to get better signing at lower cost.

The starting point for savings is refurbishing old signs right in your own shop. You can give your old signs new faces in a matter of minutes in an applicator...and actually, you can switch over to red stop signs for as little as $3.60 per sign.

For additional savings, look at those projects you have wanted to start but, perhaps, put off because you thought they might be too costly. Projects like new reflective street name signs, hazard markers—distinctive trailblazers and guide signs that direct motorists day and night for city parkways or county roads. Faces for these signs can be made to order for you at lower cost than you think. All you have to do is apply the face to your sign blank in your applicator. Takes only five minutes.

For instance, you can reflectorize street or road name signs in a 3′ x 4′ applicator that turns out 10 or more of these 6″ x 24″ signs every five minutes.

Or you can make 8″ x 36″ bridge end markers to reduce the danger of darkness with any bridge hazard in your area—for as little as $1.95 per marker face.

Important, too, is the fact that operating an applicator is so simple you don't need specially trained men to make reflective signs. Production is fast—so you won't need extra people in your sign shop even during the busy spring season. When maintenance crews are idled by weather conditions their time can be more fully utilized by sign making jobs in the shop.

Vacuum applicators are available in a variety of sizes—including this new, table top "Economist" model. Designed for small shops, it produces nine 24″ x 24″ reflectorized signs per hour at low cost.

Anyone can operate a vacuum applicator—no special training is needed. You can make signs any time you need them—and give your community better safety with better signing at low cost.

Your 3M Representative can tell you more about how to get the most out of your vacuum applicator—to put more into your signing program. You can get complete information by writing: 3M Company, Dept. RBM-89, St. Paul 6, Minnesota.

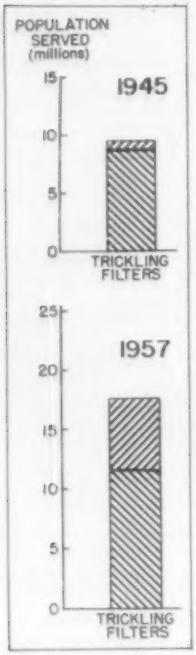
MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW
St. Paul 6, Minnesota

REG. U.S. PAT. OFF.
SCOTCHLITE
BRAND
REFLECTIVE SHEETING
The term "Scotchlite" is a registered trademark of 3M Co.

Add to the useful life of your Trickling Filters with

VITRIFIED CLAY FLOOR BLOCKS

12 Years Growth of Trickling Filters

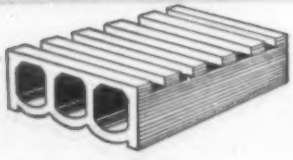


The useful life of a trickling filter depends on the type of underdrains. Permanence is only actual in a filter floor that can defy the destructive forces of acids, alkalis and bacterial action.

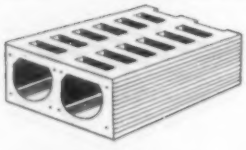
And just one proven product meets all the requirements for a trouble-free floor—vitrified clay underdrain blocks. Made in modern plants under rigid quality controls impossible for most substitute materials, they offer long-term low cost plus maximum crushing strength, higher velocity in flow, light weight and ease of laying. Also a 50-Year Guarantee against actions of acids and bacteria.

Trickling Filters are experiencing fast growing acceptance as an important factor of the national campaign against stream pollution. 2,682 such sewage works were completed by 1957. The TFFI is proud of its contribution toward giving the nation clean waters for health, recreation and industry.

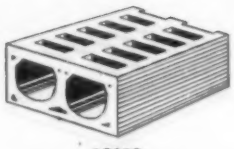
TFFI TRICKLING FILTER



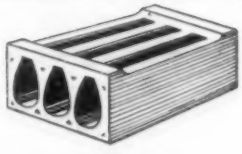
TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas



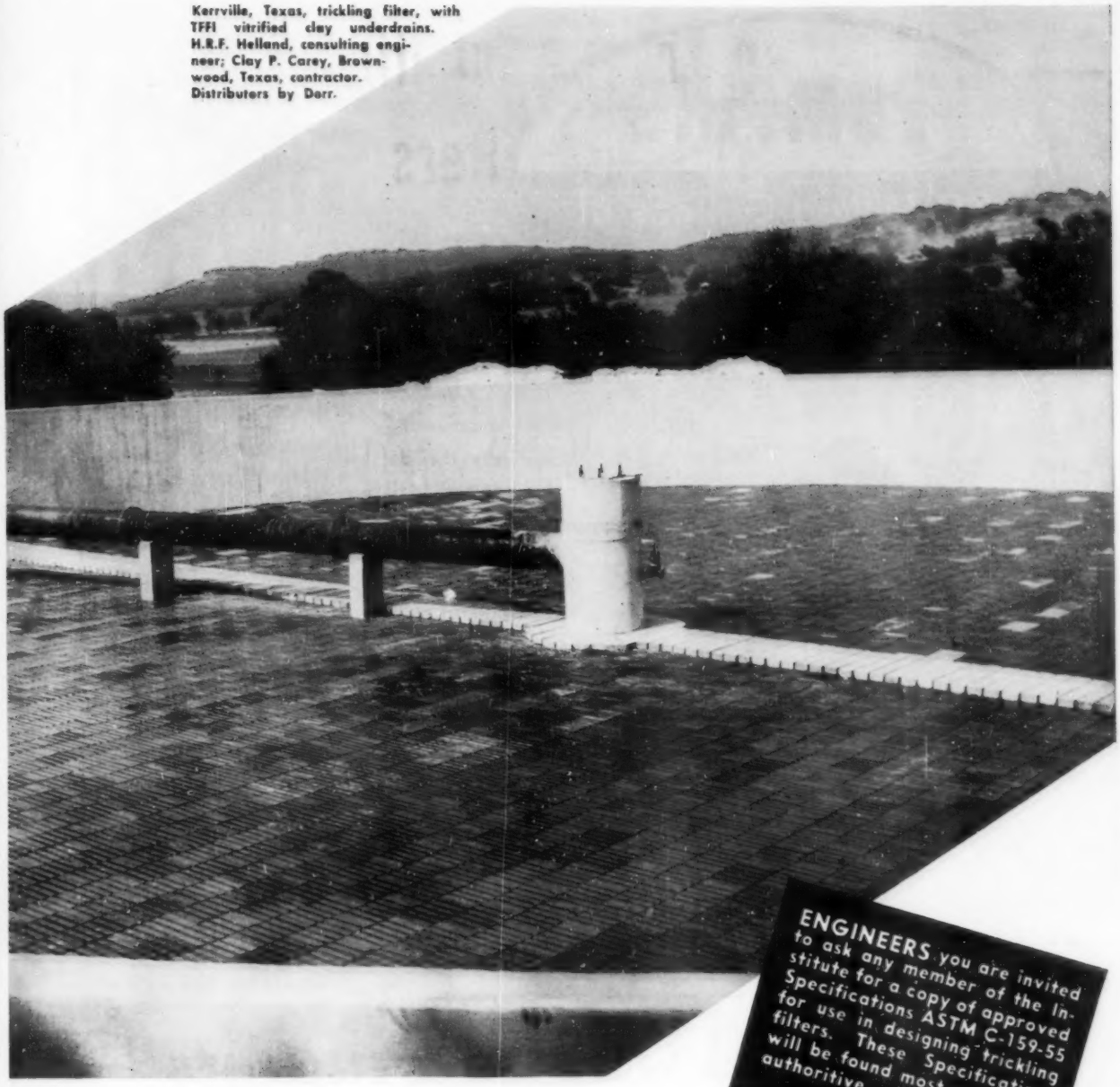
ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



BOSCO
Bowerston Shale Co.
Bowerston, Ohio



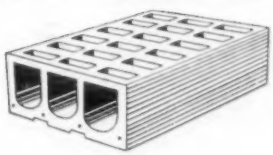
NATCO
Natco Corporation
Pittsburgh 22, Pa.



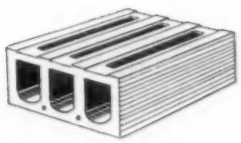
Kerrville, Texas, trickling filter, with TFFI vitrified clay underdrains. H.R.F. Helland, consulting engineer; Clay P. Carey, Brownwood, Texas, contractor. Distributors by Dorr.

ENGINEERS you are invited to ask any member of the Institute for a copy of approved Specifications ASTM C-159-55 for use in designing trickling filters. These Specifications will be found most useful and authoritive.

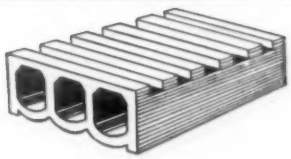
FLOOR INSTITUTE



DICKEY
W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.



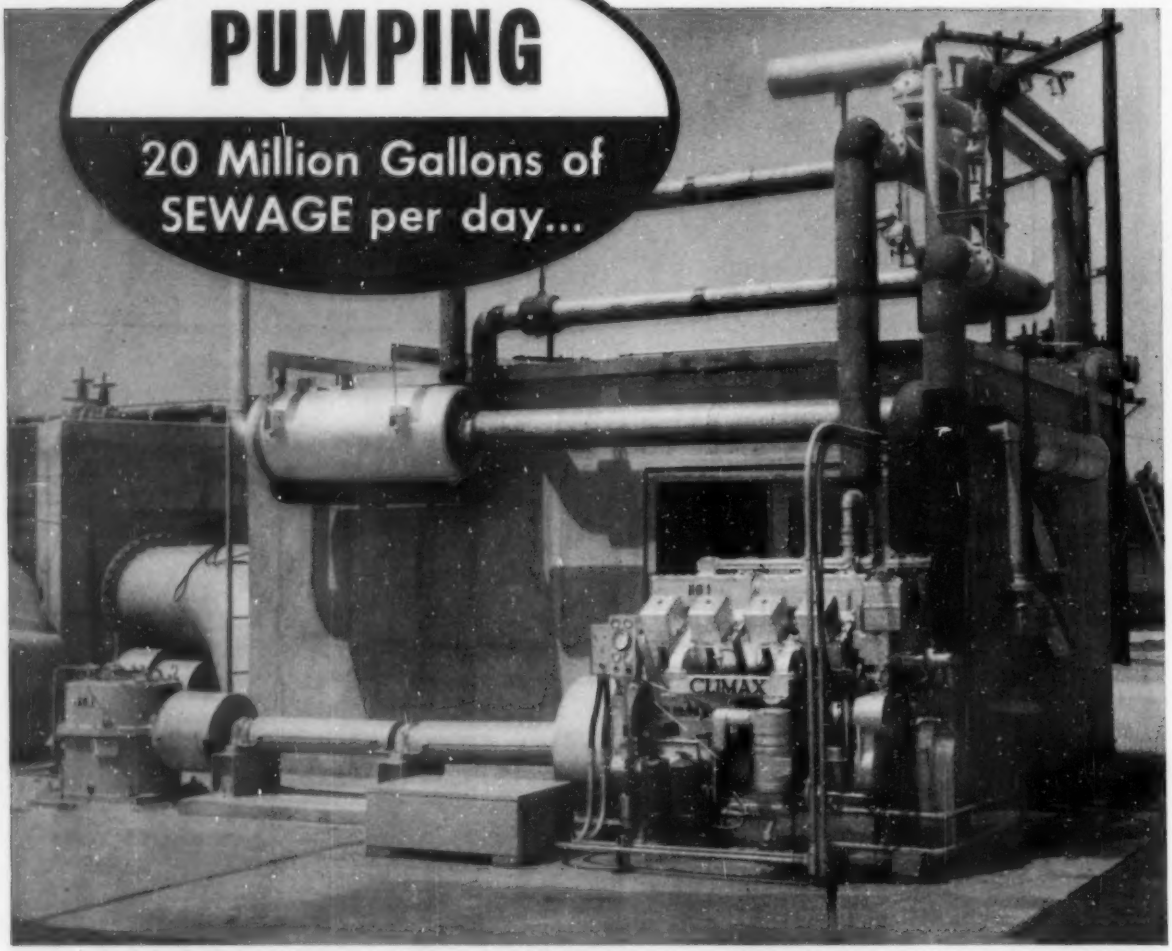
POMONA
Pomona Terra-Cotta Co.
Pomona, No. Car.



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.

PUMPING

20 Million Gallons of SEWAGE per day...



at Orange County, California, Sanitation District

two CLIMAX V-85 ENGINES *power the pumps*

Driving centrifugal pumps, two Climax V-85 Engines running at 775 rpm, pump approximately 20 million gallons of sewage per day in Plant No. 1 of the County Sanitation Districts of Orange County, Calif., at Ellis and Verano Streets, Santa Ana. These V-85 Climax Engines —8-cyl., 7½-in. bore x 7-in. stroke, 2474 cu. in. displacement—are burning sludge gas from the digesters; when this gas is not available the engines are automatically switched over to butane fuel. They operate with vapor phase cooling, and the waste heat is used in the digesters. The Climax V-8, unusually compact in design, packs more power into less space. Rugged, too, for durability with dependability in continuous duty sewage plant service. Its famous fuel economy is built-in. For all its plus-value features in detail, get Bulletin SA-584.

CL-109

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY—CLINTON, IOWA

Reflectorize with *Lead-Free* No. 831 (High Index) and UB 68 (Medium Index) Sign Kits

Write today for free booklet. Contains test and specification data, application procedures, and other helpful information.

If you're in a sign budget dilemma, you'll solve your problem more readily with optical quality No. 831 and UB 68 Reflective Glass Beads. No. 831, best for white and yellow signs, and UB 68, for application in the darker pigmented colors, are *lead-free* ... won't turn dark, provide extra reflectivity throughout a longer life for greater safety and economy.

Bead budgets go farther ... the result of better research and engineering and advanced methods of manufacture. And with today's overall improvements in quality, gradation, and application techniques, you have the combination that spells better reflectorized signs for less—with *whitest white, lead-free, optical quality* glass beads by Flex-O-Lite. Write for details.

FLEX-O-LITE

FLEX-O-LITE MFG. CORPORATION

8301 FLEX-O-LITE DRIVE • P. O. BOX 3066 (AFFTON BRANCH)

ST. LOUIS 23, MISSOURI

Maintaining county road in Colorado

Mixing black-top in Idaho

Widening a highway in Oklahoma

Top GRADE MEN

Snowplowing a county road in Colorado

Spreading fill in Alabama

choose Allis-Chalmers

Trimming up a haul road in Mississippi

Ditching county road in Iowa

When selecting motor graders for your next job, consider this swing to the FORTY FIVE . . . then check this *combination* of features available only in Allis-Chalmers motor graders·

- ROLL-AWAY moldboard, an Allis-Chalmers exelusive, reduces friction by moving the load up and ahead of the board . . . handles more material per horsepower than any other make.
- High-arch front axle clears big windrows . . . reduces axle dozing that hampers steering and cuts production.
- Extra high throat clearance accommodates big rolling loads without jamming material against the circle.
- Toggle-type controls, another Allis-Chalmers exclusive, give operators positive control . . . eliminate wrist-snapping backlash.

move ahead with ALLIS-CHALMERS

. . . power for a growing world

Pioneering city street in Alabama

Scarifying a township road in Canada

all over the country

Fine-grading base material in Oregon

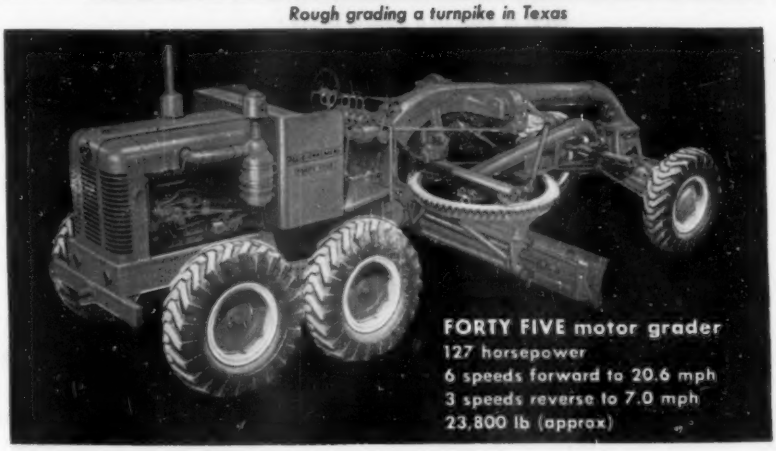
Removing rough spots on a haul road in Colorado

FORTY FIVE motor graders

Sloping a bank in Idaho

Rough grading a turnpike in Texas

Your Allis-Chalmers dealer will arrange for you to try these and the many other features that make the Allis-Chalmers FORTY FIVE your best BIG grader buy. Tell him to set the date. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



A-C

ROLL-AWAY is an Allis-Chalmers trademark.

OCT. 10, 1954: 6" SNOW AND SLEET—CLEVELAND, OHIO
OCT. 28, 1951: 5" WET SNOW—UPPER NEW ENGLAND
OCT. 25, 1955: FREEZING RAIN—CHICAGO AND DETROIT
OCT. 24, 1956: 3" SNOW, FREEZING RAIN—SOUTH DAKOTA
OCT. 20, 1952: 4" SNOW—WILKES-BARRE-SCRANTON, PENN.

(Source: U. S. Weather Bureau Climatological Data)

Prepare for early storms—
order STERLING ROCK SALT now

If you're caught without rock salt, early storms can paralyze traffic, cause serious accidents, mean heavy business losses. Don't let this happen to you! Stockpile your Sterling Rock Salt now and stockpile enough. (When treated with Storite, Sterling Rock Salt can be kept from caking even in outside storage.) Order *now* from your nearest International Salt Company sales office.

INTERNATIONAL SALT CO., INC., SCRANTON, PA.

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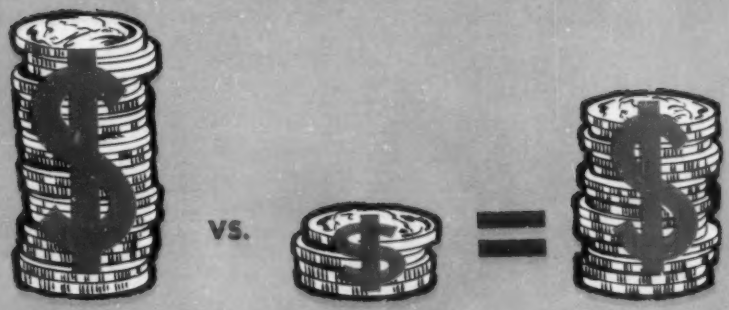
Newark • New York City • Philadelphia • Pittsburgh • Richmond • St. Louis

LITTLEFORD clarkmoore HEATER-PLANER

Here is an increased maintenance program at no extra cost



COST OF LEVELING PAVEMENT | **COST OF PLANING PAVEMENT** | **SAVINGS REALIZED**

The diagram at the left dramatically points out the increased maintenance program accomplished by the use of the Littleford-Clarkmoore Heater-Planer. As an example, your maintenance dollars will buy just so much "black-top". This "black-top" may be used either for a leveling course not needed to support the traffic or it may be used on additional streets previously planed by the Littleford Heater-Planer. Results . . . you cover twice the area as before.

The Littleford-Clarkmoore Heater-Planer can actually double your present maintenance program. How? . . . Quite simply! The Littleford heater-planer performs resurfacing operations heretofore impossible. It replaces excess leveling courses not needed to support traffic . . . money saved can be used in resurfacing other pavements . . . making possible the use of the same amount of maintenance dollars to fill a larger program.

To find out how this revolutionary new machine can increase your maintenance dollars simply return the postage free air mail reply card at the bottom of this page. Our Planer Consultant will be glad to advise you.

LITTLEFORD BROS., INC. • 457 EAST PEARL STREET • CINCINNATI 2, OHIO

- ☐ **HEATER-PLANER**—Please send me at once—and without obligation—Littleford's heater-planer bulletin 18.
- ☐ **TRAIL-O-PATCHER**—Bulletin 28 describing the Littleford Model 700 Trail-O-Patcher as shown on the next page.
- ☐ **KETTLES**—Bulletin 1 describing the Model 84-HD-Tar and Asphalt Maintenance Kettle as shown on next page.

NAME_____

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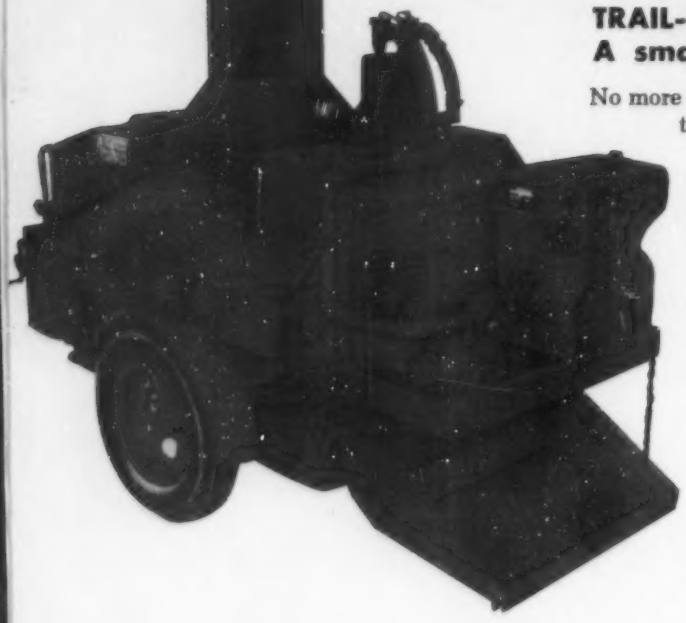
TITLE_____

OFFICES IN CINCINNATI, OHIO AND ALBANY, NEW YORK

Constant quality . . . and an eye to cost!

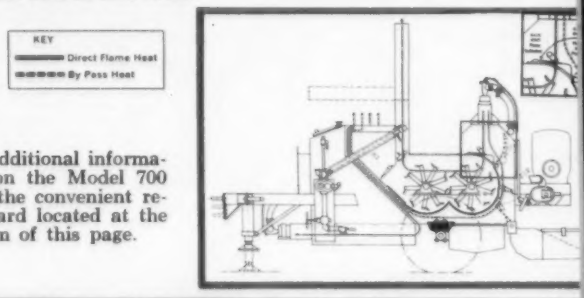
LITTLEFORD MODEL 700

TRAIL-O-PATCHER BITUMINOUS MIXER . . . A small asphalt plant on wheels



No more delays waiting for trucks to return . . . no worries about the weather! The Model 700 is designed to produce a high grade bituminous mix . . . on the job, the year round.

A completely self-contained unit: has twin shaft, heat insulated pugmill for drying and mixing the aggregate; its own 220 gallon heated bitumen supply tank and an accurate bitumen metering system. *The 700 is the only mixer offering all of these facilities* . . . It's ready for quick-fixing of any road, anywhere with less manpower, less cost and in less time.

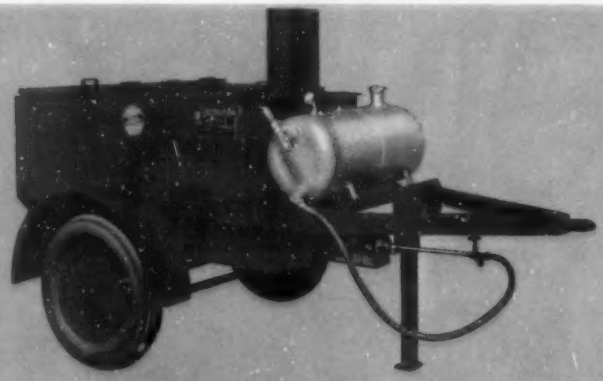


For additional information on the Model 700 mail the convenient reply card located at the bottom of this page.

FASTESY HEATING . . . and SAFEST MAINTENANCE KETTLE EVER PRODUCED

This modern tar and asphalt kettle turns out more "hot stuff" at a lower cost and with a greater amount of safety than any other kettle. Produces a continuous flow of material due to the patented features that are incorporated: "Double-heat circulation", the heat system that utilizes the entire heat from the burners and the "Screen Reservoir" that keeps the melted material from cooling when the cold asphalt is added. When the 84-HD is equipped with a hand spray or a motor spray attachment it becomes a complete maintenance kettle capable of doing patch or skin work. Sizes range from 80 to 325 gallons.

For additional information on the 84-HD Maintenance Kettle, mail the convenient postage paid air mail reply card at the bottom of this page.



PATENTED SCREEN RESERVOIR is formed by an inverted "V" shaped screen which keeps the cold material out of the hot reservoir.

PATENTED DOUBLE-HEAT CIRCULATION utilizes all the heat produced by the burners . . . uniformly distributes heat over entire melting surface of the inside tank.

FIRST CLASS PERMIT No. 23 (Sec. 34.9 P.L.&R.) Cincinnati, Ohio

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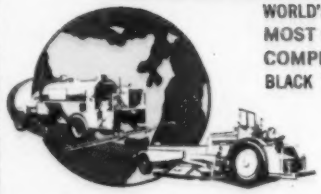


WORLD'S MOST COMPLETE LINE OF COMPLETELY ENGINEERED BLACK TOP EQUIPMENT

SEND AIRMAIL REPLY CARD

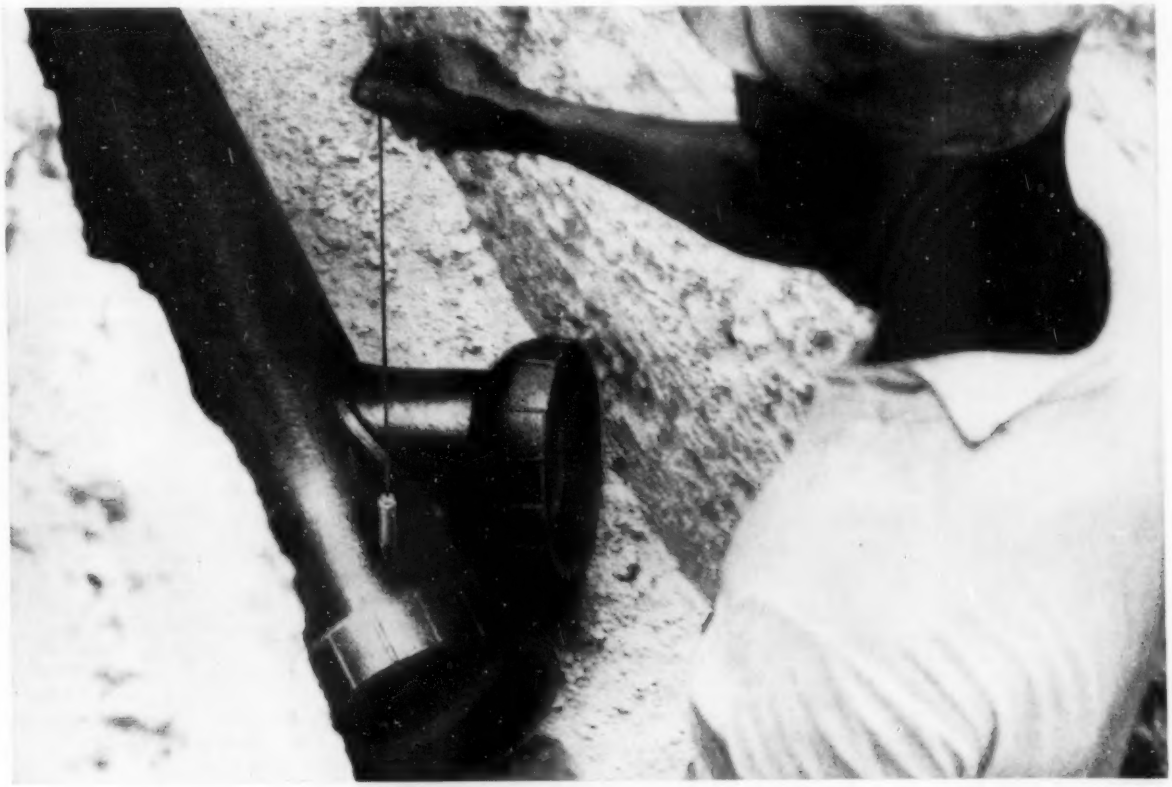
REQUEST YOUR FREE LITERATURE

Keep Plumbing Codes Where They Belong!

Local plumbing codes are a *local* problem. They are written to meet local conditions, by responsible officials who know what these local conditions require. If they need revision, a "national" plumbing code is *not* the answer . . . not if local communities are to be protected as they should be.

Take Clay Pipe, for example. Although it provides more dependable, longer-lasting protection in all localities, it's the *only* completely safe pipe in *many* specific areas. It's the only pipe that is completely impervious to the corrosive attack of sewage acids, and gases, including caustic drain-cleaning compounds, detergents, scalding water, ground garbage – every waste the modern household discharges.

If your community needs this kind of protection . . . and what community doesn't . . . local officials responsible for its health and welfare should decide. Don't let a "national" plumbing code rob them of this vital responsibility. Keep your plumbing codes where they belong . . . in the hands of the men who are closest to the problem.



C-159-1A

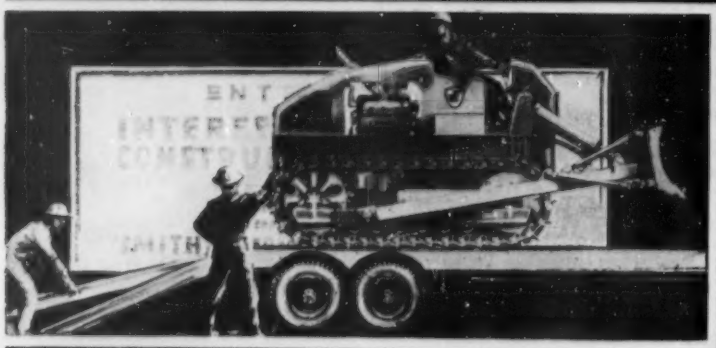
Vitrified **CLAY PIPE** *Never Wears Out*

NATIONAL CLAY PIPE MANUFACTURERS, INC. 1820 N Street, N. W., Washington 6, D.C.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio • 703 Ninth & Hill Bldg., Los Angeles 15, California • Box 172, Barrington, Illinois • 1401 Peachtree St., N. E., Atlanta 9, Georgia

B - 462

. . . it's here!

engineered and built for your job



THE GREAT NEW

EIMCO 103

Eimco revolutionized the tractor field when it first introduced such exclusive features as up-front operator position; the famous "Unidrive" teamed with single stage torque converter and dual final drives, plus new high standards of quality and craftsmanship, in the world famous Big E, the Eimco 105.

Now, Eimco's advanced engineering and on-the-job research has resulted in a medium size 100 HP tractor series that sets new standards in its field. The Eimco 103 series incorporates every proven advance-design feature of the 105, plus . . .

"QUADRA-TORQUE" — Four forward and four reverse speeds at the flip of a lever. Operator can select speed ratio, go from forward to reverse and back again, at any engine or tractor speed, with finger-tip ease.

GREATER GROUND CLEARANCE — Every Eimco 103 has a full 17 inches ground clearance, up to 40% more than comparable machines! Permits operations forward or reverse on grades up to 90%, with new, even greater maneuverability.

UNITIZED "STRESS FLOW" CONSTRUCTION — Just like a massive strong locomotive, your Eimco 103 is unit-built from large strong steel castings molded to shape and thickness required, to withstand greater stress than you can ever place upon it. Main frame, final drive and center housing are one super-strong casting, as are the track frames, with no bolts or welds. Components still readily accessible . . . and what a difference this strong, rigid unitized construction makes on really tough jobs!

SELF-CLEANING AIR CLEANER — Great new feature that does away with cleaning the bowl every few hours! Utilizes venturi action of exhaust pipe to clean itself automatically.

These are just the highlights! For all facts and data, write for specifications and comparative fact sheet, listing vital statistics of all leading makes of tractors and front end loaders. Prove to yourself, the superiority, in every quality component, of the great new Eimco 103 series! Write Dept. AN-3, The Eimco Corporation, P. O. Box 300, Salt Lake City-10, Utah, U.S.A.

THE GREAT NEW EIMCO 103 SERIES:

Eimco 103 — Tractor and Dozers
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Greater Drawbar Pull — Greater Workability!

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BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

E. J. Yoder has been employed by Purdue University in charge of the Soils Laboratory of the Joint Highway Research Project since the fall of 1949. His research activities while at Purdue have been primarily in soils and pavement design. In addition to supervision of various research projects for the Indiana State Highway Department, he has conducted research for the Corps of Engineers.

Prof. Yoder was born in Goshen, Ind., and received his BSCE degree from Purdue University and his MSCE from the same University with majors in highways and soil mechanics. After graduation he became a research assistant at Purdue from August, 1946, to December, 1947. From January, 1948, to September, 1949, he held the position of Assistant Professor in Civil Engineering at The Ohio State University. Professor Yoder has been Soils Consultant for the Pennsylvania Turnpike Commission since 1950. Also, he has done consulting work on the Indiana Toll Road, as well as on the Interstate Highways in Ohio and Kentucky.

He is presently consultant for the Bureau of Public Roads in the Base Course and Pavement Design Section. Also, he is in charge of teaching pavement and airport design at Purdue.

Professor Yoder is a Registered Professional Engineer and a member of NSPE. He is an Associate Member of the Highway Research Board and a member of ASCE, Tau Beta Pi, Chi Epsilon and Sigma Xi. A textbook written by him on pavement design will be published in September.

He is married and has four children, three sons and a daughter. His hobbies consist of camping, boating, woodworking and music.

"K&M" ASBESTOS-CEMENT SEWER PIPE

permanently, automatically root-tight

Sewer pipe maintenance headaches disappear with "K&M" Asbestos-Cement Sewer Pipe.

Flow-stopping, pipe-clogging roots can't penetrate the exclusive patented "K&M" FLUID-TITE coupling. In repeated tests, "K&M" Asbestos-Cement Sewer Pipe successfully resisted infiltration even when external water pressure was 25 psi, the equivalent of a 58-foot head.

Service remains continuous and uninterrupted . . . with fewer inspections and periodic cleanings and reduced treatment loads and costs. "K&M" Sewer Pipe does not corrode and is immune to electrolysis.

In fact, "K&M" Asbestos-Cement Sewer Pipe is a tax-saver in planning, installation, transportation, and handling.

5 CRUSHING STRENGTHS OF K & M SEWER PIPE

Size Inches	Class 1500	Class 2400	Class 3300	Class 4000	Class 5000
6	1500	2400	3300		
8	1500	2400	3300		
10	1500	2400	3300	4000	5000
12	1500	2400	3300	4000	5000
14	1500	2400	3300	4000	5000
16	1500	2400	3300	4000	5000

In short, practically indestructible materials plus eighty-five years of asbestos engineering give you the finest, most dependable sewer pipe available. Write today for more information.

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BEST IN ASBESTOS

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Exclusive FLUID-TITE Coupling joins lengths of various crushing strengths and sizes. Assemble it in any weather—without the aid of heavy machinery. It's water-tight and root-tight.

TARCO SPREADERS

the "Big Scottie"

The "Big Scottie" is a **special body-type chemical spreader** . . . designed for the correct, money-saving application of granular or pelleted chemicals for ice and snow control. Using its **exclusive Air-Blast spreading assembly**, a perfect ring-free, streak-free, "bird-shot" melting pattern is obtained. The "Big Scottie's" **5 cubic yard** load covers 27 miles of pavement (400 lbs. per mile up to 30 feet wide). **None of the salt touches whirling blades or discs** . . . and there is no material crushing or breakage.

Material is conveyed to the stainless steel spreading assembly at accurate pre-determined rates. Each unit is equipped with a detailed application rate chart so the operator can quickly select the correct feed and driving speed to fit any particular storm.

Your choice of either gasoline engine or P. T. O. hydraulic power is available. Spreader operation is **cab controlled** by means of one simple and quickly made adjustment. The "Big Scottie" is designed for mounting in the body of a standard dump truck or right on the truck chassis . . . either mounting is accomplished quickly and easily. The "Big Scottie" accommodates all the usual attachments such as hinged top screens, steel safety bumper, catwalk, ladder, fenders and flaps, flasher lights and spinner assembly for abrasives. Because it's designed for the special emergency work for applying de-icing salts in minimum quantities, the **"Big Scottie" quickly pays its initial cost in material savings alone.**

See your nearest Tarco Dealer or write us for more complete details about the "Big Scottie" . . . **another Tarco Spreader "that saves as it salts".**

---

the "Scotchman"

The **original stainless steel chemical spreader** using the unique and **exclusive Air-Blast principle** for the correct and economical application of straight de-icing salts.

Spreads bagged or bulk material. **Cartridge-type**, electric **starting power unit** . . . completely protected and operating in filtered air. All desirable controls: Width of Spread, Direction of Spread and Density of Material Application—all made instantly and easily. (Cab controls optional).

The "Scotchman" more than saves its cost the first season plus giving you faster and safer ice and snow control. Your Tarco Dealer will give you a free demonstration . . . or write us.

the "Arcrite"

The "Arcrite" is the aggregate spreader you've been looking for . . . **a tough, rugged spreader** that does a job; that you don't have to baby; that will stand rough abuse. The "Arcrite" is a man's spreader . . . not a light weight toy.

Here are just a few of the "Arcrite's" unique features: 1) special engine mounting designed for **easy "no load"** starting. 2) **stainless steel spreading disc.** 3) special **adjustable hanger frame** fits snug to tail gate without use of material chute, 4) rugged, **all welded box-like frame** for easy handling and storage.

See your Tarco dealer for all the details of this more rugged disc-type spreader.

TARRANT MFG. CO.

28 Jumel Place, Saratoga Springs, N. Y.

Don't run short of salt when demand is heaviest

Order enough Morton Rock Salt now

Be prepared before unexpected storms ice your streets and highways. Eliminate confusion, extra work and accidents by stockpiling Morton Rock Salt now for winter ice and snow removal. Store it in unused buildings, garages, loading platforms or outdoors near key traffic points. You can do this without loss or inconvenience—and, if you wish, a Morton Consulting Engineer will be happy to advise you.

Morton Rock Salt is 8 times better than abrasives. One man and one truckload of Morton Rock Salt does a better job of ice and snow removal than 8 men and 8 loads of abrasives. Morton Rock Salt leaves no messy residue on streets, in gutters and sewers . . . needs no flushing after a thaw . . . won't blow away or leave a rutted, dirty pavement. Non-toxic, Morton Rock Salt also is inexpensive. (It generally costs far less than calcium chloride.)

Send for more information today! Fill in and mail coupon below for valuable help with ice and snow removal.

☐ *Please send me your free book on ice and snow removal.*

☐ *I would like a Morton representative to advise me on how best to stockpile Morton Rock Salt for my town.*

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City_____ County_____ State_____

MORTON SALT COMPANY

INDUSTRIAL DIVISION

Dept. PWB, 110 N. Wacker Drive
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DANGEROUS WATER. Not long ago, faulty sewage disposal too often contaminated lakes and rivers... made them unfit for bathing, drinking or fishing.

MODERN SEWERAGE SYSTEMS, in which cast iron pipe and fittings are used, play a major role in keeping America's water clean, pure and wholesome... safe for bathing and drinking.

U.S. PIPE

FOR WATER, SEWERAGE AND

U. S. PIPE AND FOUNDRY COMPANY

but better than ever today!

Exacting quality checks from mine to main assure U. S. Pipe dependability

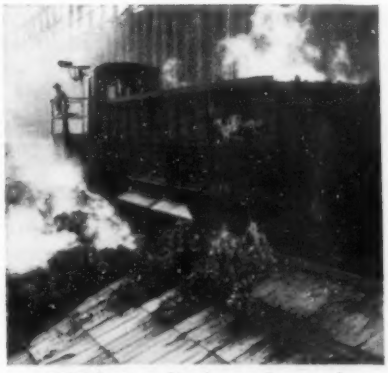
With leadership goes responsibility . . .

Cast iron pipe, for example, long recognized as America's basic water carrier, must be dependable and long-lived.

U. S. Pipe makes sure it is. By constantly checking and rechecking its pipe from start to finish . . . from mining to final casting.

The water officials who do such fine work planning and protecting the nation's water supply can be sure of this:

In U. S. cast iron pipe they have a fine ally to work with.



COKE, being discharged on coke wharf, has been made in our modern ovens from carefully blended mixture of coals obtained from U.S. Pipe mines.

HOT PIPE is inspected and weighed before entering the heat treating furnace. Each length of U. S. Pipe is subjected to temperatures automatically controlled for uniformity.

THE SPECTROGRAPH is used by U. S. Pipe to make timely and accurate chemical determinations . . . one of many quality checks that assure top performance of U. S. Pipe.

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PREVENTIVE MEDICINE

The sub-title of this very useful text is "Principles of Prevention in the Occurrence and Progression of Disease." It is presented in three principal parts: 1, Prevention of occurrence; 2, prevention of progression; and 3, supporting services for preventive medicine. Many of our readers will be interested in various Chapters of Part 1 where water (24 pages); milk-borne illnesses (13 pages); waste disposal (34 pages); air pollution (34 pages); insect vectors (7 pages); radiation, disaster defense, accidents, housing and some diseases are considered. The remainder of the text is devoted largely to the medical viewpoint but much of it should be of interest to engineers because it is through an understanding of medical approaches to disease prevention that the non-medical professional man can contribute the full value of his own skills. There are 702 pages, 33 tables and 59 illustrations; most of the latter are schematic or chart-type. There are 31 contributors; the editors are Herman Hilleboe and G. W. Larimore, Commissioner and Deputy Commissioner, New York State Dep't. of Public Health. Published by W. B. Saunders Co., Philadelphia, Pa. Price not given.

STANDARDS FOR SWIMMING POOLS

The minimum standards for residential swimming pools have been revised and now include definitions, safety factors and other pertinent factors. 9 pp; second revision; National Swimming Pool Institute, Harvard, Ill.

FLEXIBLE PAVEMENT DESIGN, RESEARCH AND DEVELOPMENT 1958

Five papers sponsored by the Committee on flexible pavement design and presented at the 37th Annual Meeting of the Highway Research Board are contained in this 61-page bulletin, as follows: "Notes and the Corps of Engineers' CBR Design Procedures," by Charles R. Foster and R. G. Ahlvin; "A Summary of Load Transmission Tests on Flexible Paving and Base Courses," by R. C. Herner; "How Oklahoma Uses Its Present Highways to Establish Criteria for Evaluating Future Structural Design Need," by R. A. Helmer; "Analysis of Flexible Pavement Deflection and Behavior Data," by A. C. Benkelman; and "Flexible Pavement Design in Idaho," by L. F. Erickson. Copies of Bulletin 210 are $1.20 each and are available from the Highway Research Board, 2101 Constitution, Washington, D. C.

SUBSURFACE DRAINAGE OF HIGHWAYS AND AIRPORTS

This 21-page bulletin constitutes a report of the Highway Research Board Committee on subsurface drainage. Among the factors discussed are climate, soil and ground water investigation, capillarity and permeability, road location, surface drainage, subsurface drains, interception drains, water table drains, drainage of granular bases, economies, underdrain construction and underdrain failures. Appendices detail a method of test for determining saturated capillary height of soil, and suggested methods of test for the coefficient of permeability of soils with values less than one foot per day and greater than one foot per day. Copies of Bulletin 209 are available from the Highway Research Board, 2101 Constitution, Washington, D. C., and are 50¢ each.

FROST ACTION AND ROADS

This 32-page bulletin contains the final report of the Committee on Load Carrying Capacity of Roads as Affected by Frost Action, as presented at the 37th Annual Meeting of the Highway Research Board, representing the conclusions arrived at by virtue of the several cooperating state project results. Copies of Bulletin 207 are available from the Highway Research Board, 2101 Constitution, Washington, D. C., and are 80¢ each.

MUNICIPAL WATER FACILITIES

The Public Health Service has published an 84-page booklet on "Municipal Water Facilities in Communities of 25,000 population and over in the U. S." It shows the organized community water facilities for about 850 municipalities, indicating the number of people served; the population; ownership; number of services and number of meters; source of supply; storage; safe yield of system; transmission capacity; treatment methods and plant capacity; laboratory control facilities; pumping capacity; distribution storage; and improvements needed. Data are to Jan. 1, 1958. This is Public Health Service Publication 661. Probably obtainable from the Water Supply and Pollution Control Program, Public Health Service, Washington 25, D. C.

MUNICIPAL YEARBOOK

A comprehensive view of urban government in the United States is presented in the 26th annual volume of the Municipal Year Book. The 1959 edition contains 22 major tables with information on the organization, personnel, finances, and activities of cities in the United States.

Highlights of the 1959 edition include special sections on urban renewal and economic classification of cities. The urban renewal section shows comprehensive information for 252 cities over 5,000 population on programs, organization, number of employees, expenditures, elements approved and number of persons relocated.

New material is presented on special assessments in 876 cities over 10,000 population: Improvements financed by special assessment, methods of financing, allocation of costs, city participation in financing and latest issues of special assessment bonds. An article on urban counties reviews 1958 developments in inter-governmental cooperation and summarizes programs and services of 43 state associations of county officials. A new section on traffic engineering shows, for 1,037 cities over 10,000, information on ordinances, traffic control devices and traffic surveys and planning.

The Municipal Year Book, 1959; Orin F. Nolting and David S. Arnold, editors; International City Managers' Association, 1313 East 60 Street, Chicago 37, Illinois. 606 pp. $10 postpaid.

MOMENT CONTOURS FOR BRIDGE ABUTMENT WINGWALLS

Bulletin #183 presents design data for wingwalls of constant thickness. These design data are in the form of moment contours for wingwalls of the various proportions being used by the Iowa State Highway Commission. Copies are available from the Iowa Engineering Experiment Station, Iowa State College, Ames, Ia., at 75¢ each.

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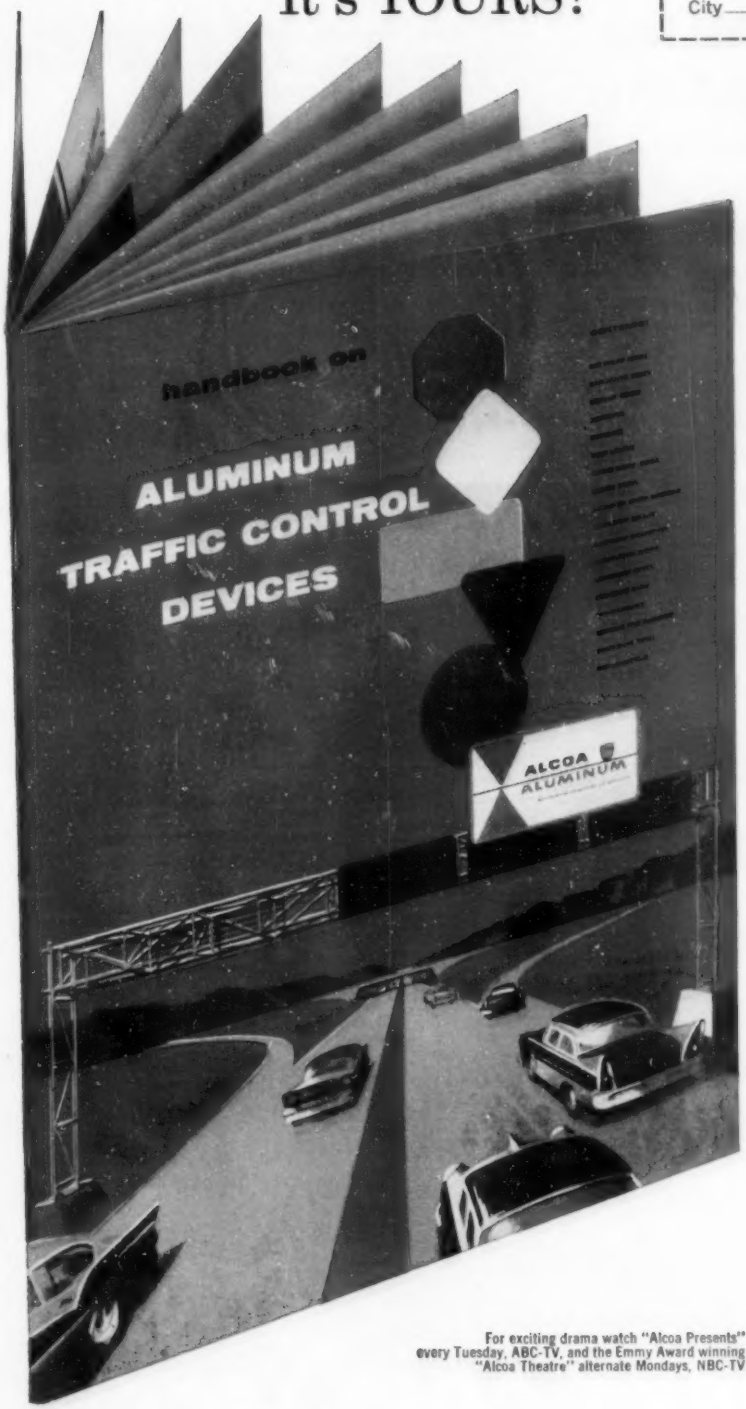

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NEW LISTINGS

New Variable-Speed Drive Bulletin

262. Bulletin No. 195 contains photographs, applications, detailed information on horsepower and operating mechanisms on variable-speed drives and data on remote controls. Check the reply card or write Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles 22, Calif.

All-New Transistorized Mobile Radio

243. General Electric's complete, new transistorized mobile radios are available in 10, 30 and 75-watt ratings, 150-174 mc. The design of these units permit front-mounting in any make or model car or truck. For catalog on specifications, models and operation write to General Electric Co., Communication Products Dept., Lynchburg, Va., or check the reply card today for your copy.

Reinforced Concrete Cribbing for Highways and Embankments

267. Typical wall sections and details of standard units of open or closed face concrete cribbing are covered in catalog from American-Marietta Co., Concrete Products Div., American-Marietta Bldg., 101 East Ontario St., Chicago 11, Ill. Check the reply card for general specifications and installation of the cribbing.

Catalog on Plane Table Equipment

269. Alidades, tripods with built-in plane table head, stadia rods, plane table boards and accessories are covered in catalog from Kern Instruments, Inc., 120 Grand St., White Plains, N. Y. Check the reply card.

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274. This completely different copying method offers an unmatched combination of advantages and is the one method that meets the copying needs of any office. Check the reply card or write Eastman Kodak Co., Business Photo Methods Div., Rochester 4, N. Y. for literature.

Butterfly Valves for Manual or Automatic Control and Shut-Off

287. Bulletin No. 583 covers allowable pressure drop for 7 classes of Rockwell metal-seated Wafer butterfly valves in lbs. per sq. in., divided into pressure groups. Also covered are construction features and methods of control. Check the reply card or write W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn., for your copy.

Snow Plows For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Sno-Plows, Inc., Clayton, N. Y., or check the reply card.

M-B Packer Body for Refuse and Garbage Collection

297. M-B Corp., New Holstein, Wisc., has available an 8-page catalog describing the new Big "V" packer body. Check the reply card for complete specifications and illustrations.

MORE LISTINGS ON PAGES 36 TO 51

Allis-Chalmers Crawler Tractors and Motor Scrapers

306. Two catalogs offered by the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wisc., give engineering features and operating advantages of the TS-260 motor scraper and the HD-6 diesel powered crawler tractor. Check the reply card for specifications.

Better Tomorrows Begin Today at Allis-Chalmers

307. 32-page catalog gives facts about power generating and electrical transmission and distribution equipment, industrial tractors and road building machinery. Check the reply card or write Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis.

Plunger Pumps of Heavy Duty Design

309. Plunger pumps, simplex, duplex, and triplex of heavy duty design including dual valves and improved reduction gear mechanisms are covered in bulletin KSP-3 which gives selection charts and application data and is available from Komline-Sanderson Engineering Corp., Peapack, N. J., or by checking the reply card.

Manual on Calcium Chloride in Concrete

315. The 64-page Manual on calcium chloride in concrete is a ready reference to quantitative data and includes 20 charts and illustrations which refer to the use of calcium chloride in concrete construction. Check the reply card or write Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

Steel Pipe Rubber Gasket Joint

338. Catalog describes how the joint can be used in coupling pipe ranging from 36 to 120 in. and it tells how the joints permit rapid installation in the field and provide a watertight coupling. Check the reply card or write Kaiser Steel Corp., Fabricating Div., P. O. Box 95, Fontana, Calif., or check the reply card.

Water, Sewage and Industrial Waste Treatment Equipment

339. This 20-page Bulletin 2617 presents Link-Belt Company's complete sanitary engineering equipment line. Check the reply card or write Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill., for data on how this equipment works.

Five Standards For Measuring Big Tractor Value

378. Performance, dependability, matched equipment, serviceability and dealer organization are the standards listed in Bulletin 33341 available from Caterpillar News Service, Peoria, Ill. Check the reply card.

Pneumatic Ejectors Give Trouble-Free Pumping

394. The Shone ejector is designed for extreme dependability in pumping jobs where gallonage is limited but solids are not in domestic and industrial waste treatment. Literature is available from Yeomans Brothers Co., 1999 N. Ruby St., Melrose Park, Ill., or check the reply card for pumping applications in the 30-1000 gpm range.

Remote-Controlled Batching Equipment Cuts Paving Cycle

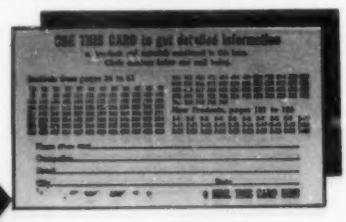
452. Catalog from Hercules Steel Products Co., Galion, O., covers dump bodies with removal batch boxes, high-speed front telescopic hoists and remote-controlled underbody batch trippers which are the special equipment used in concrete paving. Check the reply card.

Catalog on Laboratory Equipment

453. Arthur S. LaPine and Co., 6001 So. Knox Ave., Chicago 29, Ill., offers a 40-page catalog on laboratory equipment. Check the reply card.

Plastic Specimen Containers With Carrying Cases

475. Literature is available from Aloe Scientific, 5655 Kingsbury, St. Louis 12, Mo., on plastic specimen containers that are shatterproof and featherlight. Check the reply card.



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287 290 293 294 295 297 300 303 306 307 308 309
315 319 321 322 329 330 335 338 339 340 342 346
348 352 358 359 360 361 365 371 374 378 379 384
385 391 394 400 405 418 429 434 435 439 440 443
451 452 453 455 459 461 465 475 482 483 485 486
490 492 494 498 499 500 502 504 515 516 517 521
523 524 525 526 531 534 538 539 540 541 544 545
552 562 566 567 568 569 570 571 572 578 581 582
583 588 601 630 637 648 669 671 675 676 677 682
683 689 690 692 696 699 708 713

New Products, Pages 221 to 227

8-1 8-2 8-3 8-4 8-5 8-6 8-7 8-8
8-9 8-10 8-11 8-12 8-13 8-14 8-15 8-16
8-17 8-18 8-19 8-20 8-21 8-22 8-23 8-24
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Dallas, Tex., Oct. 12-15

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New Orleans, La., Oct. 18-21

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Atlantic City, N. J., Oct. 19-23

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Providence, R. I., Oct. 21-22

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Atlantic City, N. J., Oct. 22-24

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Minneapolis, Minn., Oct. 26-28

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287 290 293 294 295 297 300 303 306 307 308 309
315 319 321 322 329 330 335 338 339 340 342 346
348 352 358 359 360 361 365 371 374 378 379 384
385 391 394 400 405 418 429 434 435 439 440 443
451 452 453 455 459 461 465 475 482 483 485 486
490 492 494 498 499 500 502 504 515 516 517 521
523 524 525 526 531 534 538 539 540 541 544 545
552 562 566 567 568 569 570 571 572 578 581 582
583 588 601 630 637 648 669 671 675 676 677 682
683 689 690 692 696 699 708 713

New Products, Pages 221 to 227

N-1 N-2 N-3 N-4 N-5 N-6 N-7 N-8
N-9 N-10 N-11 N-12 N-13 N-14 N-15 N-16
N-17 N-18 N-19 N-20 N-21 N-22 N-23 N-24
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Sanitary Landfill By Moving Earth Only Once

485. "How to Construct a Sanitary Landfill" with a minimum amount of earth moving is the subject of a 20-page manual, illustrated with how-to-do-it drawings and containing helpful cost data. Write Drott Mfg. Corp., Milwaukee 15, Wis., or check the reply card.

Coatings to Resist Acids, Sewer Gases and Other Corrosive Elements

486. Corrosion Control Co., 33 West 42nd St., New York 36, N. Y., analyzes your corrosion problems, formulates the proper protection and makes and applies the product. Check the reply card for a questionnaire for you to answer on your corrosion problem.

Perfect Vision Bridge Rail

492. Description of a new, galvanized bridge rail with see-through design and unusual strength is covered in catalog from Bethlehem Steel Co., Bethlehem, Pa. Check the reply card.

Comprehensive Bulletin on Guard Rails

494. Bulletin gives specific uses for guard rails as well as detailing specifications and illustrations of their applications. Write Whitmyer Bros., Inc., RFD #2, Hammonton, N. J., or check the reply card for your copy.

Use The Reply Card

Standard Instrument and Control Panels

500. Details of construction, dimensions, weights, instrument mounting and accessories for six standard styles of instrument and control panels are described in 16-page catalog from Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio. Check the reply card.

Lighting of Freeway Signs

515. Complete data on sign lighting is covered in literature from Pacific-Associated Lighting & Mfg. Co., 1260 Pennsylvania Ave., San Francisco 7, Calif. Check the reply card for types of lighting, specifications and operation.

New Preco "All-Transistor" Automatic Blade Control

521. Bulletin by Preco Inc., 6300 East Slauson Ave., Los Angeles 22, Calif., explains in detail the wide range of applications to which the automatic blade control for graders can be adapted. Check the reply card.

Dump Truck and Trailer Bodies of Advanced Design

525. Modern hydraulic hoists and both steel and aluminum dump bodies and dump trailers specially designed to handle maximum legal payloads and provide longer life are covered in catalog from Galion Allsteel Body Co., Galion, O. Check the reply card.

Calcium Chloride For 2-Way Highway Ice Control

538. For data on the use of calcium chloride in ice control write Solvay Process Div., Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y. Check the reply card for full details.

Lift or Lower Snow Plows Automatically

540. Battery operated or fan-belt driven hydraulic controls that lift or lower snow plows are described in literature from Monarch Road Machinery Co., 1331 Michigan St., N.E., Grand Rapids 3, Mich. Check the reply card.

Catalog on Multiple Pressure Readout System

544. A 12-page, 2-color, Catalog 30B1000 describes F & P multiple pressure readout system which measures and records hundreds of different pressures simultaneously using a single high accuracy transducer. Check the reply card or write Fischer & Porter Co., 225 Jacksonville Rd., Hatboro, Pa.

New UHF Ultra High Flow Vertical Turbine Pumps

545. These pumps maintain high efficiencies over wider operating ranges, thereby assuring continual and efficient service under any variety of accidental conditions. Write Worthington Corp., Harrison, N. J., or check the reply card for full specifications.

Emergency Barricades That Fold Away to Nine Inches

552. Guard-Gate comes to you boxed in one handy kit weighing only 17 lbs. and when open stands 3 ft. tall and extends to 8 ft. Literature from West Side Iron Works, 327 Front N.W., Grand Rapids, Mich., or by checking the reply card.

Case History of a Major Street Lighting Improvement

562. A joint project between the city and the utility on a street lighting improvement is movered in literature from Pfaff & Kendall, 84 Foundry St., Newark 5, N. J. Check the reply card for data on how this job was done.

Motrac 2-Way Radio, A Reliable Mobile Radio

567. The Motrac radio incorporates numerous new design features that will assure long, trouble-free life. Write Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Ill., or check the reply card for data on reliability and operating costs.

Continuous Tapered Aluminum Poles

569. General data on aluminum poles that includes information on shafts, brackets, transformer base, shoe base and cap are covered in catalog from Colonial Electric Products, Inc., 1-115 Market St., East Paterson, N. J. Check the reply card for full details.

Permanent Carry Container for Back Door Refuse Collection

578. A flexible plastic container that has a 52 gal. capacity, weighs 6 lbs. and is waterproof is described in literature from County Chemical Co., 2475 N. Jerusalem Rd., East Meadow, N. Y. Check the reply card today.

Automatic Torque Controlled Constant Viscosity Lime Shakers

582. Viscomatic shaker shakes lime as a paste with cold water and provides maximum hydrate availability. Check the reply card or write Infilco Inc., Tucson, Ariz., for details on this lime shaker and its utilization in water and waste applications.

Refuse Body and Loader Picks Up, Compacts and Dumps

583. In one-man operation the Econ-O-Packer front end loader speeds up residential collection with driver view loading and comes in body capacities from 28 to 40 cu. yds. Check the reply card or write Econ-O-Way Inc., 2675 Commercial St., San Diego 13, Calif., for details.

BUSINESS ADMINISTRATION

Save Space By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

How Good Are Your Truck Drivers? The Tachograph Will Tell You

682. Accurate records of truck engine operation are made available by the Tachograph. Find out how savings and safety can be promoted by getting Bulletin SU-3 from Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo. Details of construction and descriptions of operation are included.

Even "the toughest track ever made" (Allis-Chalmers, of course) needs adjustment to give you the extra life that's built into it. Make this on-the-job track check.

Take a pry bar and see how far you can raise the track above one of the support rollers. More than *two inches* means it's too loose. Take up the slack, move the tractor back and forth to equalize the tension, then check again.

Regular track inspection is an easy way to make sure you get the most out of "the toughest track ever made."

WHAT **toughest** REALLY MEANS

It's more than just talk. Take sidebars, for instance. Some track makers get by with mere *surface* hardening, which sacrifices wearing quality for easier machining. But Allis-Chalmers *deep*-hardens the forged steel, leaving a tough inner core for high impact strength. Then, *pin and bushing bores only* are annealed, and the superhard sidebar is machined to precise finish dimensions.

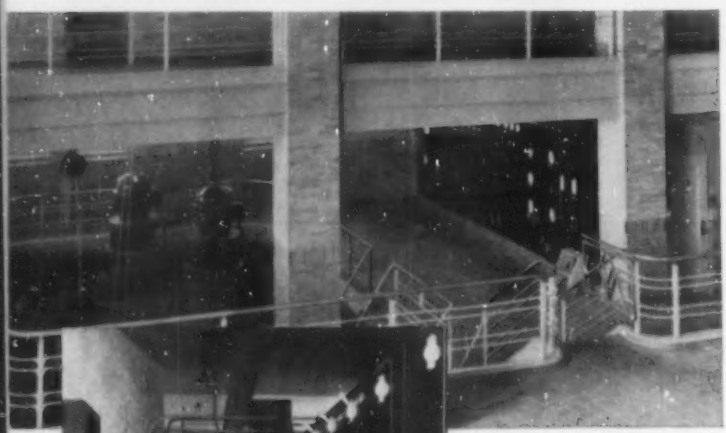
The moral of the story: *Stay on the right track*—"the toughest track ever made." Get original-quality parts from your Allis-Chalmers dealer.

move ahead with
ALLIS-CHALMERS
power for a growing world

"AS SPECIFIED" Wilmette's Water Treatment Plant and Pumping Station is Equipped with Cutler-Hammer Control

WILMETTE, ILLINOIS WATER TREATMENT PLANT & PUMPING STATION
Capacity: 15,000,000 gallons per day
Superintendent of Public Works: Mr. A. Lund
Chief Operator: Mr. W. W. Frye
Consulting & Design Engineers: Alvord, Burdick & Howson
Electrical Contractor: Sievert Electric Company

Main Entrance and pump room New vertical type 50 Hp low lift pumps and 300 Hp high lift pumps were installed in the existing pump room. The operator's panel was modernized to monitor both the new and existing pumping equipment.



Main Control center Cutler-Hammer Automatic Reduced Voltage Starters for the new low and high lift pumps and existing horizontal type pumps are grouped in the main control room located directly behind the operator's panel.

Auxiliary Control center A new four-section Unitrol® provides a compact control center for the new vertical type Wash Water Pump, Drain Pumps, Breaker Panel Disconnect, and custom-built meter unit.

The Wilmette, Illinois Water Treatment Plant and Pumping Station is typical of scores of Municipal Water Works which recently have been expanded to keep pace with their rapidly growing communities. Here the new 9,000,000 gallon per day addition has more than doubled the capacity of the plant which was built during the middle thirties. And in both instances Cutler-Hammer Control was installed "as specified" to direct and protect the electric motor driven pumps and equipment.

This repeated specification and selection of Cutler-Hammer Control is indicative of the users satisfaction with its performance during the past twenty-five years, and confidence in its operation in the future . . . Cutler-Hammer Control is built better to last longer.

Further, it pays to install Cutler-Hammer Control because it never becomes an "orphan." Complete factory records are maintained so that whenever pumping facilities are expanded the control equipment "grows" without having to re-engineer the total job. This feature alone has saved thousands of dollars for many rapidly growing municipalities.

Be sure you have the latest facts on Cutler-Hammer Control . . . its many features assure better plant design, important savings during installation, and dependable trouble-free operation. Write Dept. Q204, Cutler-Hammer Inc., Milwaukee 1, Wisconsin.

CUTLER-HAMMER CONTROL C-H

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • *Division:* **Airborne Instruments Laboratory.** • *Subsidiary:* **Cutler-Hammer International, C. A.**

Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

To order these helpful booklets check the reply card opposite page 36.

WATER WORKS

In-Place Cement Lining of Small and Large Pipe

25. A catalog describing a process of in-place centrifugal cement lining of pipes from 4 to 144 ins. in diameter is available from the Centriline Corp., Raymond International Inc., 140 Cedar St., New York 6, N. Y. Check the reply card for sample specifications and test results.

Wherever Water Flows, Steel Pipes It Best

26. Complete data on the use of steel pipe for water supplies are available from Steel Plate Fabricators Association, 105 West Madison St., Chicago 2, Ill. Check the reply card today.

Caterpillar Engines for Many Uses

74. Four-cycle diesels from 75 to 650 hp and electric sets from 30 to 350 KW are described in literature from Engine Div., Caterpillar Tractor Co., Peoria, Ill. Check the reply card.

How to Get Better Concrete Construction

93. A report on the use of "Pozzolith" as a means of increasing the strength and durability and reducing the permeability of concrete structures, while reducing costs at the same time, is presented by Master Builders Co., Cleveland 3, Ohio. Check the reply card today.

AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

Valve and Hydrant Construction Details

161. A 72-page catalog-type bulletin, just completed, gives detailed data on construction and application of gate valves, check valves and hydrants for water works service. Write for Bulletin 5710 from Darling Valve and Mfg. Co., Williamsport, Pa., or check the reply card.

Lay Water Mains Faster With "Fluid-Tite" Couplings

184. Get permanent water-tight joints automatically with K & M "Fluid-Tite" couplings for K & M asbestos-cement pressure pipe. Full details on this faster installation and self-energizing couplings are available from Keasbey & Mattison Co., Ambler, Penna.

Manual on Coatings to Stop Rust

235. Primer type, short oil type, heat resistant, chemical resistant and floor coatings are a few of the items covered. Also complete data on Rust-Oleum products are included. Check the reply card or write Rust-Oleum Corp., Evanston, Ill., for this valuable manual.

Foxboro Magnetic Flow Meter

238. The Foxboro magnetic flow meter measures water and wastes electrically, without any line restriction. No loss of head, no fouling, even with slurries. For detailed illustrated Bulletin 20-14B check the reply card or write The Foxboro Co., Foxboro, Mass.

Separators and Thickeners for Water, Sewage and Waste Treatment

275. Photos and diagrams are used extensively in Bulletin 315-101 to illustrate the design features, the types of tanks used and the operating principles of Float-Treat separators and thickeners. Check the reply card or write Chain Belt Co., Dept. P. R., Milwaukee 1, Wisc., today.

Waterworks and Municipal Castings

293. Meter boxes and covers, yoke and couplings, service boxes and manhole covers are covered in 24-page catalog. Check the reply card or write H. W. Clark Co., Mattoon, Ill., for full specifications.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Clamps for Pipe and Hose and Steel Straps

219. Literature is available from Marman Div. Aeroquip Corp., Industrial Sales Div., 11214 Exposition Blvd., Los Angeles, Calif., on clamps to stop leaks on low and high pressure pipe, band clamps for hose, duct, pipe strap hanger and mounting bracket and stainless steel flags for identification purposes. Check the reply card.

Renew Pipe Performance With Cement Mortar Lining

322. Application of the Tate and Spunline process for cement mortar lining of existing pipe lines with a minimum of interruption of service is described, with diagrams, photographs and specifications in Catalog 15-58. Write to Pipe Linings, Div. of American Pipe and Construction Co., P. O. Box 457, Wilmington, Calif., or check the reply card.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are ⅝"-¾"x¾"-¾" and 1". Check the reply card.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 18, Wisconsin.

Technical Bulletin on Swimming Pool Filtration Equipment

335. A 24-page technical Bulletin 626, designed to help persons planning pools which must comply with local and state health regulations, is now available from the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. Check the reply card for data on size selection charts, typical installations and drawings.

Concrete Admixtures and Joint Sealers

346. Retarding and accelerating densifiers for concrete and mortar, coatings for exposed aggregate concrete, non meltable mastic waterstops and quicksetting products are covered in 8-page bulletin available from Sika Chemical Corp., 29-49 Gregory Ave., Passaic, N. J.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

Trenchers for Water and Sewer Line Construction

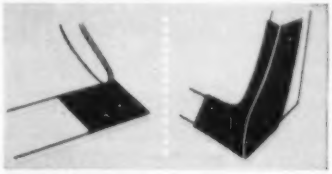
384. Three Cleveland J trenchers incorporating major advances in trencher design and operating advantages are described in Bulletin L-104 available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Check the reply card for digging capacities, specifications and dimensions.

Don't kid yourself! An extra half inch of wear on the cutting edge of your dirt-mover can cost you plenty! Wear that chews into the moldboard weakens it—especially around bolt holes. Then you may have to rebuild or even replace the whole works!

Renew or replace cutting edges and bits before moldboard wear starts. You'll be money ahead on repairs and 'way out front in dirt-moving efficiency.

ONLY THE BEST IS A BARGAIN!

Speaking of moving dirt, Allis-Chalmers really has the edge! Take dozers, for instance. Cutting edges and end bits are made of finest alloy steel, forged and electronically heat-treated in a process that deep-hardens working faces for extra-long wear, toughens the core to resist impact. For rock-dozing or worse, Allis-Chalmers makes *heavy-duty* edges, end bits and wrap-around end bits.



The man from your Allis-Chalmers dealer knows all about moldboards—for a new machine or reconditioning one you own—and the edges he recommends are *right*. Whatever you need, get original-quality Allis-Chalmers parts—*made for the machine*, best for the job.

move ahead with
ALLIS-CHALMERS
power for a growing world

FROM ENGINE TO REAR AXLE

QUALITY COMPONENTS

matched to your exact needs

Brockway HUSKIE

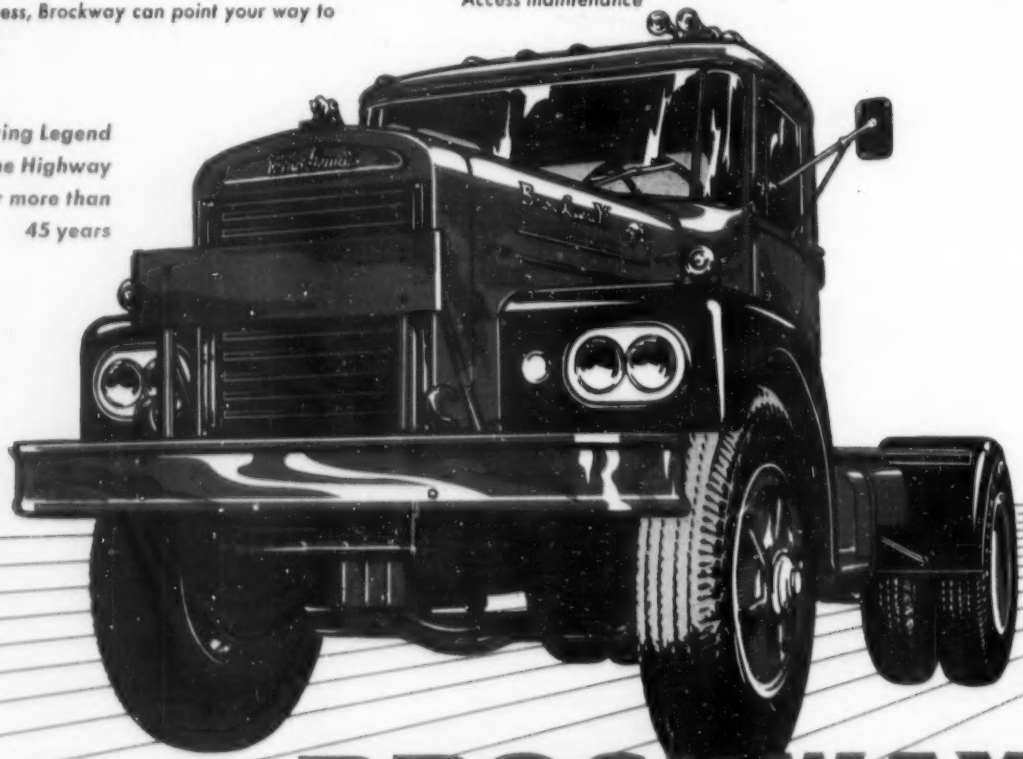
MAXIMUM PAYLOAD with durability and efficiency that no mass-produced truck can equal

Unlike mass-produced trucks, every major part of the Brockway chassis is specifically selected to fit the exact requirements of your job. And Brockway's unique flexible production methods offer you the widest choice of individualized vehicles in half the delivery time. If trucks are the tools of your business, Brockway can point your way to higher profits.

Among the NEW Brockway Huskie features:

● Wider choice of power—gasoline or diesel ● Larger cooling capacity ● Improved power steering ● All steel Safety-View cab ● Dual headlamps ● Step-Aside fenders ● Easy-Access maintenance

A Living Legend of the Highway for more than 45 years



BROCKWAY
MOTOR TRUCKS CORTLAND, N. Y.

Division of Mack Trucks, Inc.

To order these helpful booklets check the reply card opposite page 36.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

Deepwell Submersible Pumps for Municipal Water Supply

391. 6 and 8-in. Sumo submersible pumps are described in Bulletin No. B10001A from Sumo Pumps Inc., Stamford, Conn. Check the reply card for performance chart and specifications.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehensive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

Remote Supervisory Pump Operation

405. Bulletin RTM describes remote supervisory pump operation by using telephone lines for communication circuits. Write Healy-Ruff Co., 2255 University Ave., St. Paul 14, Minn., or check the reply card for data on this unit for water and sewage works.

Measurement of Liquid Flow Across Weirs

418. The Burgess-Manning Type ML meter is applied to weir boxes for measurement of flow across 90° V-notch weirs. For specifications and installation procedures write Burgess-Manning Co., Penn Instruments Div., 4110 Haverford Ave., Philadelphia 4, Pa.

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

465. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

U. S. Tyton Joint Pipe

490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co. Birmingham 2, Ala., or check the reply card.

Parshall Measuring Flumes

498. Measure water accurately with all-steel Parshall measuring flume. Free-flow discharge tables, formulas, weights, capacities and dimensions are covered in Catalog B-31-C available from Thompson Pipe & Steel Co., 3025 Larimer St., Denver 1, Colo.

V-Notch Chlorinator For Chlorine Flow Control

502. An 8-page catalog on the W & T Series A-721 chlorinator is available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Chlorinator is adaptable to any type of chlorinator control and feed rate may be controlled manually or automatically.

Modern Elevated Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered.

Bitumastic For Lasting Protection Against Corrosion

570. Bitumastic protective coatings prevent corrosion of metal and deterioration of concrete and masonry and are fully covered in catalog from Koppers Co., Inc., Tar Products Div., Pittsburgh 19, Pa.

Portable, Standby Or Continuous Power

440. Generators and power plants for emergency, portable continuous power are described fully in literature available from Katolight Corporation, Box 89-107, Mankato Minnesota. Information on motor generator sets, high frequency changers and independent generators up to 400 K. W. is included.

Handling Chlorine Liquid and Gas

571. Fischer & Porter Co., 230 Jacksonville Road, Hatboro, Pa., has available Technical Bulletin WWC 3B4 on the handling of chlorine liquid and gas from container to dispenser. It includes pertinent facts about chlorine, lists safety precautions, and outlines recommended practices for designing and constructing chlorine supply systems.

AWWA Butterfly Valves Custom Built to Specifications

630. Butterfly valves that can be operated by air, oil, water, electrically or manually and are made in standard sizes to 24 ins. are fully described in literature from Fabri-Valve Co. of America, P. O. Box 4352, Portland 8, Ore. Check the reply card for full specifications.

Turn Your Water Meter Reading Inside-Out

671. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

Electronic Locators for Water Mains, Services, Valves and Boxes

677. Miniaturized line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours and weighs only four lbs. when completely assembled is described in literature from Wilkinson Products Co., 3067 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

Use The Reply Card

Cast Iron Pipe That Bends Under Stress

683. This cast iron pipe from 2 through 48 ins. has as advantages extra strength, high resistance to impact, bendability, greater reliability, ample wall thickness and adaptability. Check the reply card or write American Cast Iron Pipe Co., Birmingham, Ala., for full specifications.

Bulletin Covers Step-by-Step Action on the Water Problem

689. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Thos. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois, or by circling the reply card.

Water Filtration Costs Can Be Reduced

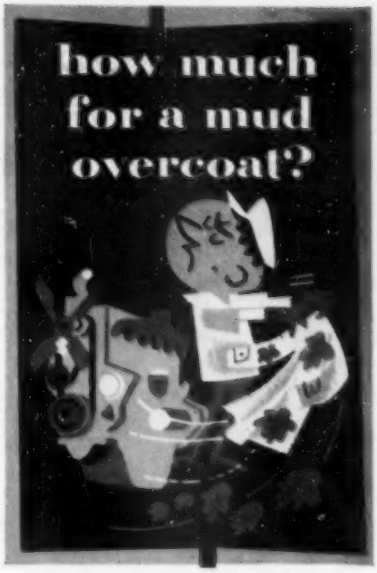
692. The "Celite" system of diatomite filtration makes possible reduced installation cost, with space requirements a fraction of those for equivalent sand filtration. For informative literature write Johns-Manville, Box 14, New York 16, N.Y.

Mueller Drilling, Tapping and Inserting Machine

696. The Mueller B-100 double pressure chamber tapping machine makes faster taps, assures pressure tight connections and can be used by hand or with power. Check the reply card or write Mueller Co., Decatur, Ill.

Flexible Plastic Pipe For Water Distribution

708. A new-type polyethylene resin flexible pipe is described in Catalog No. 402 available from Orangeburg Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y. Fittings, installation, size and weight tables and physical properties are several of the sections covered.

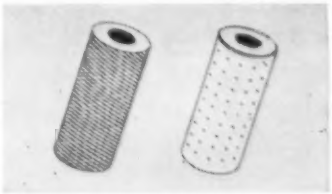


A thick mud overcoat on your tractor engine could cost you more than mink! Mud acts like insulation, impairs cooling of exposed surfaces—and you may be heading for an expensive overhaul. In any case, overheating steals power, spoils lube oil and cooks the life out of engines.

Hose the day's mud off. Clear away dirt or brush—especially around the engine and radiator. This not only helps cooling, it may also uncover trouble before it starts costing you money!

KEEP IT CLEAN INSIDE, TOO!

Efficient filter protection keeps Allis-Chalmers engines clean *inside*. Large fuel filters, full-flow oil filters and oil bath air cleaner with pre-cleaner are on guard against all kinds of sneaky, wear-causing dirt particles you might never see.



Help your engine live a long, healthy life. Service filters regularly and replace elements at recommended intervals. The service expert from your Allis-Chalmers dealer knows best replacement periods for any conditions. See him for genuine Allis-Chalmers replacement filters—*made for the machine*, best for the job.

move ahead with A-C
ALLIS-CHALMERS
power for a growing world

To order these helpful booklets check the reply card opposite page 36.

SEWERAGE AND WASTE TREATMENT

Entirely New Small Sewage Treatment Plant

40. The Sparjair units are package type plants that range in size from a 50 population equivalent to 5000 and utilize the contact stabilization process to produce a clear, nuisance free effluent. Copies of Bulletin 22-S-94 are available from Walker Process, P. O. Box 266, Aurora, Ill., or check the reply card.

Stationary Engines For Sewage and Water Treatment Plants

82. Engines that operate on sewage gas, gasoline, butane or natural gas are described in literature from Climax Engine Mfg. Co., Div. of Waukesha Motor Co., Clinton, Iowa. Check the reply card.

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

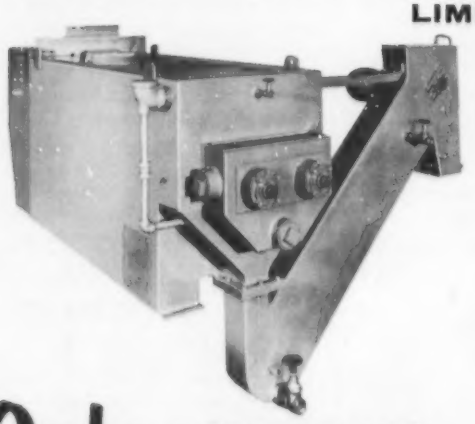
Theory of Controlled Digestion With Floating Cover Tanks

89. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Specify

VISCOMATIC®

LIME SLAKERS!



CUT SLAKING TIME

SAVE ON LIME

Only INFILCO

has the experience gained from the manufacture and installation of many automatic torque controlled constant viscosity lime slakers.

PROVED IN PERFORMANCE

The "VISCOMATIC" Slaker slakes lime as a paste with true pug mill action...slakes fast with cold water...provides maximum hydrate availability.

Torque actuated water controller maintains constant viscosity ...assures proper slaking with little attention...eliminates temperature controls, water metering and insulation.

Write for INFILCO Bulletin 255. It describes the "VISCOMATIC" Lime Slaker and its utilization in water, waste, and process applications.

INFILCO INC.

General Offices—Tucson, Arizona

Field offices throughout the United States and other countries

G91

Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 64-page Catalog 952 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit, Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Fibre Pipe For Sewer Lines and Septic Tank Connections

232. Bermico bituminized fibre pipe is lightweight, rootproof and easy-to-install. Check the reply card or write Brown Co., 150 Causeway St., Boston 14 Mass., for full details.

Literature on Concrete Sewers

270. Literature on concrete sewers is available from Portland Cement Association, Dept. 10-89, 33 West Grand Ave., Chicago 10, Ill. Check the reply card for data on concrete for all modern pipelines.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy reply card or write Combustion Engineering Inc., Raymond Div., 1132 W. Blackhawk St., Chicago 22, Illinois.

7 Developments For Municipal and Industrial Sanitation

319. Bulletin 6043 assembles for review the 7 major Dorr-Oliver equipment designs and process developments introduced in the past 3 years. It includes photographs, line and wash drawings and descriptive sketches of each development. Check the reply card or write Dorr-Oliver Incorporated, Stamford, Conn., today.

Governors and Speed Switches

340. New style governors and speed switches which have a variety of applications are covered in bulletins from Synchro-Start Products, Inc. 8151 No. Ridgeway Ave., Skokie, Ill. Check the reply card for prices and specifications.

Data and Specifications on Aluminum Grating Walkways

531. Aluminum walkways for bridges, sewage and water treatment plants and garages are covered in bulletins available from Washington Aluminum Co., Inc., Knecht Ave. & Pennsylvania R. R., Baltimore 29, Md.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135A describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Standardized Motor Control Centers

581. The Unitrol is designed to meet your specific control requirements by providing full open phase protection with 3-coil overload relays and other features. Check the reply card or write Cutler-Hammer, Inc., Milwaukee 1, Wisc.

Sewer Cleaning Service By National Power Rodding

601. N.P.R.C. has mobile-mounted equipment and trained personnel ready at all times for routine sewer cleaning jobs or specialized service. Write National Power Rodding Corp., 1000 South Western Ave., Chicago 12, Ill., or check the reply card for services available from this company.

Lightweight, easy-handling aluminum signs go up fast. While R. J. Colpitts looks on, foreman Omer Lane easily installs this sign in only 10 minutes. Alhambra's signs are fabricated from Kaiser Aluminum blanks with reflectorized sheeting by the Mask-Off Company of Monrovia, California.

"For our money, only cost-saving aluminum signs will do!"

... says R. J. Colpitts, Traffic Engineer, Alhambra, California

"We like aluminum traffic control signs because we are able to get the type of sign we want—with both initial and long range savings over other materials," reports R. J. Colpitts, Traffic Engineer, Alhambra, California.

"And we know we'll save plenty on maintenance and replacement costs, as well. With rustproof aluminum, the oxidation problem is reduced to an absolute minimum. There's no need for us to protect the edges and back surfaces of our signs.

"What's more, because aluminum signs are so easy to work with, they give our sign shop greater flexibility. We can tailor-make our sign program to suit our particular needs with little added equipment.

"No doubt about it. With us, it's aluminum traffic control signs all the way!"

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Let us make a bid. For expert service on money-saving aluminum signs, call the manufacturer, fabricator or Kaiser Aluminum sign blank jobber near you.

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Charlotte, Mich.
Paul H. Callender Co.
Chicago, Ill.
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Spencer, Ind.
Stello Products
Cleveland, Ohio
Osco Steel Co.
U. S. Steel Supply
Clinton, Mass.
Standard Sign & Signal Co.
Dallas, Tex.
All Quality Sign & Mfg. Co.
Elmira Heights, N. Y.
Eastern Metals of Elmira, Inc.
Evanston, Ill.
Northwest Screenprint Co.
Grand Prairie, Tex.
Sargent-Sowell, Inc.
Houston, Tex.
Western Sign & Supply Co.
Indianapolis, Ind.
Midwest Fire & Safety Equipment Co., Inc.
Lancaster, Pa.
John I. Nissly Co.
Little Rock, Ark.
Moody Equipment & Supply Co.
Marion, Ind.
Jim Newey and Assoc.
Metairie, La.
W & A Engineers
Miami, Fla.
Biscayne Fire Equipment Co.
Minneapolis, Minn.
Lyle Signs, Inc.
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Mask-Off Co.
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CITY_____ ZONE____ STATE_____

To order these helpful booklets check the reply card opposite page 36.

Complete Story of Rubber as a Coupling Medium in Pipelines

295. "Joint Enterprise", a booklet describing Tylox rubber joints for coupling pipe used in sewerage, drainage and waterworks projects is now available from Hamilton Kent Manufacturing Co., 7 West Grant St., Kent, Ohio. The booklet also contains illustrated case histories of Tylox-Jointed installations, and suggestions to assist engineer in specifying Tylox joints for both tongue and groove, and bell and spigot pipe. Check the reply card.

Centrifugal and Turbine Type Pumps For Water and Sewage Plants

331. Turbine-type pumps, close or flexible couple drive, and end suction centrifugal pumps and mixed flow pumps are described in Catalog M available from Aurora Pump Div., The New York Air Brake Co., 636 Loucks St., Aurora, Ill. Included is a pump selection guide and spigot pipe. Check the reply card.

Application and Design of Prefabricated Pumping Stations

637. This manual is intended for a guide in designing sewage pumping stations and in explaining the use of prefabricated underground sewage pumping stations. Check the reply card or write to Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill., for your copy.

STREETS AND HIGHWAYS

Tractor Loader Can Be Converted Into Eight Different Machines

38. Multiple-purpose tractor loader can be converted to a street sweeper, backhoe, fork lift, angle dozer, crane and rotary broom in a short time. Check the reply card or write Massey-Ferguson Industrial Div., 1009 South West St., Wichita 13N, Kans., for well illustrated catalog.

Ford Tractors Equipped With Loader of 2500 lb. Lift

162. New Ford tractors give you multi-job versatility with a full line of attachments. Check the reply card or write Tractor and Implement Div., Ford Motor Co., Birmingham, Mich., for data on this rugged and powerful tractor.

International Wagner Heavy-Duty Loaders and Backhoes

195. International Wagner loaders and backhoes are matched with International utility tractors and are described in Catalog CR-1076-I available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

Case Utility 310B Backhoe-Loader

282. The Case wheel-mounted backhoe-loader is described and illustrated in 8-page, 3-color Bulletin CUS-110, released from J. I. Case Co., Racine, Wis. Check the reply card for mechanical details of the backhoe, loader and heavy-duty tractor.

Why and How To Use Pneumatic Tired Rollers

290. The why and how of pneumatic tired rollers on base and surface courses, sealing completed fills, surface treatments, floated surfaces, hot and cold asphalts and stabilized soils are covered in Bulletin 10 from Tampo Mfg. Co., San Antonio, Tex. For information on operating conditions and compaction charts check the reply card.

Foundation Investigation and Pressure Grouting

48. Foundation investigation and pressure grouting and the various miscellaneous services of Sprague & Henwood are described and illustrated in literature from Sprague & Henwood, Inc., Scranton 2, Pa.

How To Build Stabilized Heavy Traffic Pavements

300. A 16-page booklet published by Seaman-Andwall Corp., 13050 West Blue Mound Rd., Elm Grove, Wisc. shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worthwhile booklet for every highway engineer.

From a Stump to Chips in Minutes

303. Pow-R-Stump cutter is operated by one man, handles stumps of any width and up to 33 ins. in height and will not damage curbs, driveways or sidewalks. For literature check the reply card or write Vermeer Mfg. Co., Pella, Ia.

Power Tamper for Granular Soil and Bituminous Surfacing Work

342. The Kelley Power Tamper is a self-propelled unit that is equivalent to a 10-ton roller for backfilling, road widening jobs and compacting around culverts and pipeline trenches. For complete specifications write Kelley Machine Div., Wiesner-Rapp Co., Inc., 285 Hinman Ave., Buffalo 23, N. Y., or check the reply card.

Tractor-Shovels With Drott "Four-In-One" Attachment

352. Hough rubber-tired front-end loaders come equipped with the Drott "4-in-1" bucket. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill., for literature on how to use this unit as a shovel, clamshell, scraper and bulldozer.

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HEAVY DUTY CORROSION PROTECTION

For Sewage Plants, Industrial Wastes Plants, Water Works, Pipe Coatings, Bridges, Tanks.

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Reliability, adhesion; flame, heat and electrical resistant; resists acids, alkalies, solvents and weather, to give you smooth and perfect protection of vulnerable surfaces. Choice of many colors.

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CORROSION CONTROL CO. 33 West 42nd St. New York 36

Specialists in heavy duty corrosion coatings and linings.

It's a bulldozer with exclusive "radius control" of dozing depth which allows you to bulldoze with inch-close accuracy.

It's a scraper with the stripping ability and fast, live "boiling action" of large, expensive carry-type earthmoving scrapers.

It's a Skid-Shovel with patented pry-over-shoe break-out action which gives over 5½ *tons* of break-out force, for prying out stubborn materials, stumps, and boulders.

It's a clamshell with exclusive ability to "surround" loose materials for loading, and to dump sticky materials through the bottom of the bucket.

New T-340 FOUR-IN-ONE gives you versatility unlimited in ¾ cu yd* size!

Now you can have four-machine utility at the lowest cost ever! New T-340 International Drott Four-In-One combines in one machine the actions of front-end loader, dozer, carry-type scraper, and many-purpose clamshell. With these four machine actions in one, you can handle dozens of specialized jobs single-purpose rigs can't even touch!

The Four-In-One with the new 31 dhp International T-340 crawler makes an unbeatable team for lowest-cost earthmoving and materials handling. The T-340 delivers the most push and pull-power in its size class. Famous Four-In-One Skid-Shovel versatility has never been equaled by any other loader on the market. Together, the T-340 and Four-In-One give you a wider job range and greater earning capacity than ever before available in the small crawler loader field.

Find out first hand . . . see the IH dealer nearest you! For his name, and specification folder, write International Harvester Company, Dept. PW-8 P.O. Box 7333, Chicago 80, Illinois.

*⅞ *cu yd, heaped.*

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL® DROTT®

To order these helpful booklets check the reply card opposite page 36.

Information on
Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

Catalog on Transits,
Levels and Surveying Equipment

435. Warren-Knight field equipment for surveying is covered in a 26-page well illustrated catalog. Specifications, models and prices are included. Check the reply card or write Warren-Knight, 136 North 12th St., Philadelphia.

Kaiser Aluminum Bridge
Railings and Components

451. A 24-page catalog covering engineering data and installation of aluminum bridge railings is available from Kaiser Aluminum & Chemical Sales, Inc., Dept. NR-27, 919 North Michigan Ave., Chicago 11, Ill. Check the reply card.

Ultra-Clean Sweeping For
Streets, Yards and Airports

499. A new approach to extra-clean sweeping is described in a 4-page illustrated Bulletin (No. 85.55) issued by the G. H. Tennant Co., 735 N. Lilac Drive, Minneapolis 22, Minn. Described is a 7'4" path sweeper that eliminates the use of water for dust control. Check the reply card.

Sweeping Brushes for
Road and Sanitation Departments

648. Danline brushes made of round brush wire are easily assembled and require a minimum amount of repair and maintenance. Check the reply card or write Newark Brush Co., 260 Michigan Ave., Kenilworth, N. J., for full details.

Electric Plants, Warning Flasher
Lights and Concrete Vibrators

348. Models, specifications, accessories and other data on flasher lights, electric plants and vibrators are covered in catalog from Pacific Mercury, P. O. Box 190, Van Nuys, Calif.

4-Wheel Drive
Tractor Loaders

434. A 16-page Catalog, No. 1033-5-57, describing the "Tracto-Loader Line" of front end wheel loaders is available from Tractomotive Corp., Deerfield, Ill. Covered are the five models that are in production.

Plastic Filament Street
Sweeper Pick-Up Brooms

517. Literature is available from Rynal Corp., 114 St. Joseph St., Arcadia, Calif., on plastic filaments for street sweeper pick-up brooms. They are easy to replace, storage space is eliminated and moisture will not attack them.

Data on 4+ Cu. Yd.
Motor Sweeper

524. Austin-Western, Construction Equipment Div., Aurora, Ill., has available a catalog on their Model 60 motor sweeper. Check the reply card for specifications, features and accessories.

Specification Sheets on John Deere
Tractors and Equipment

588. Information and specifications on the John Deere crawler and wheel-type industrial tractors and working equipment. Deere & Co., Industrial Division, Moline, Ill. Check the reply card. State type of tractor and equipment.

Are You Having
Compaction Problems?

676. Small, self-propelled, one-man operated heavy-duty vibratory tampers enable you to compact any material to specifications. Literature available from Vibro-Plus Products, Inc., Stanhope, N. J., or by checking the reply card.

CONSTRUCTION EQUIPMENT AND MATERIALS

Design Manual on
Complete Structural Systems

100. Manual contains technical information relative to Stran-Steel's line of joists, studs, channels, ribbed decking and metal curtain walls. It is well illustrated and contains several pages of loading tables. For this valuable Manual write Stran-Steel Corp., Detroit 29, Mich., or check the reply card today.

Black Top Maintenance
and Construction Equipment Catalog

114. A highly informative catalog covering the field of road maintenance and construction equipment is available from Littleford Bros., Inc., 457 E. Pearl St., Cincinnati 2, Ohio. Check the reply card.

Modern Compaction
Methods and Equipment

200. This 52-page Manual covers modern day compaction methods and equipment, rubber-tire rolling, compaction of asphalt mixes, aspects of vibratory compaction, stage compaction on cohesive soils and compaction of asphaltic concrete surfaces. Check the reply card or write Road Machinery Div., Bros Inc., 1057 Tenth Ave., S. E., Minneapolis 14, Minn., for your copy.

Booklet Shows Design of
Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your buildings needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co., Kansas City, Mo.

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Mean Easy Installation, Greater Economy!

The one-piece construction of our aluminum guides eliminates clumsy machine grooved or riveted flat bar assemblies. Their ease of installation and low cost (on a per foot basis, less than that of steel or other metals) are points to consider.

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Built just like a small, complete cooking range. Positive 6-way draft control gives faster, easier kindling, saves fuel, insures tenderer, juicier steaks, chops, barbecues. Cooks, bakes, warms—burns charcoal, wood or coal. Grill revolves to permit cooking to windward. Cast of heavy stove iron with steel pipe support, for lifetime service. Shipped fully assembled.

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WORLD'S LARGEST MANUFACTURERS OF FINE PARK, PICNIC, PLAYGROUND, SWIMMING POOL AND DRESSING ROOM EQUIPMENT

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Monotube Area Lighting Poles
Canton 5, Ohio • Brampton, Ontario, Canada

To order these helpful booklets check the reply card opposite page 36.

Data on Eimco, the Modern Crawler Equipment

388. Front end loaders, dozers, and fork lifts are some of the attachments available for the Eimco tractor. Check the reply card or write The Eimco Corp., Salt Lake City, Utah, for facts and qualified engineering assistance.

Catalog on Utility Bodies and Equipment

360. General service bodies, line construction bodies, aerial equipment, winch and derrick equipment and trailers are the units covered in this catalog. For design, dimensions, illustrations and descriptions check the reply card or write McCabe-Powers Auto Body Co., 5900 N Broadway, St. Louis 15, Mo.

For Prompt Service Use The Reply Card

Complete Line of Shovels, Draglines, Cranes and Clamshells

361. Bucyrus-Erie crane-excavators in sizes from ⅜ to 4 cu. yd. capacities are covered in literature from Bucyrus-Erie Co., South Milwaukee, Wis.

One Man Operated—Fully Hydraulic Truck Crane

459. Boom length which is hydraulically controlled extends to 13 ft. and can lift up to 6,000 lbs. Check the reply card or write Stanco Mfgs. & Sales Inc., 1666 Ninth St., Santa Monica, Calif., for complete data.

Drott TD-15 "4-in-1" Skid-Shovel

504. Features of the Drott skid-shovel are graphically depicted in 16-page, two-color catalog available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card for complete descriptions.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Literature on Concrete Gunning Equipment

482. The placing of gunned concrete and the equipment used in this operation are described in literature from Air Placement Equipment Co., 1009 West 24th St., Kansas City 8, Mo. Check the reply card.

Portable Water Coolers For Every Need

526. Water cooler sizes range from 1½, 2, 3, 5, 10, 15, 20, 25 and 30-gal. and are used on highway construction and maintenance and where-ever outside work is done. Check the reply card or write Horton Equipment Co., P. O. Box 2611, Houston 1, Tex.

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

Slide Rule PS1 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.

REFUSE COLLECTION AND DISPOSAL

Reduce Your Refuse Disposal Costs

150. A complete line of refuse disposal systems that include containers, giant containers, compaction bodies and compaction trailers are described in literature from Dempster Brothers, Dept. PW, Knoxville 17, Tenn. Check the reply card for data on these efficient systems.

Load-Packer 600 Points the Way to the Best in Refuse Collection

188. Bulletin W-200 explains how the Gar Wood Load-Packer gives faster operation, bigger payload, more compaction, a larger hopper and more dependable operation. Write Gar Wood Industries, Inc., Wayne, Mich., or check the reply card for full details.

Bulk Refuse Collection with Super Roto-Can

192. A bulletin describing the bulk refuse system called the City Tank Roto-Can, which provides an unusual flexibility of service and the handling of all types of trash, is available from City Tank Corp., Corona, N. Y. Check the reply card.

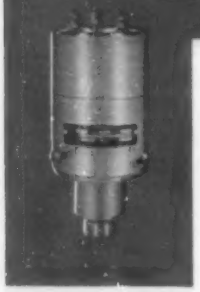
Data on the Hydro E-Z Pack Disposal Body

572. This disposal body has no moving chains, no whirling knives, and has a 76,600 lb. pressure that takes anything and compacts everything. Check the reply card or write Hydro E-Z Pack, Div. of Hercules Galion Products, Inc., Galion, Ohio, for a copy of Bulletin E-100.

Modern Methods in Sanitary Landfills

699. Up-to-date data, pictures and explanation of sanitary landfill, its methods and equipment are covered in this valuable bulletin from The Oliver Corp., 19300 Euclid Ave., Cleveland 17, O. Check the reply card for information on satisfactory garbage and refuse disposal methods.

SPEED SENSITIVE *Switches*



Synchro-Start units are available in two body designs for one, two and three switches. The GS series is for a standard distributor take-off with gear or coupling drive and has oilless bronze bushings. The GH body is for standard SAE tachometer drive and runs in oil sealed ball bearings.

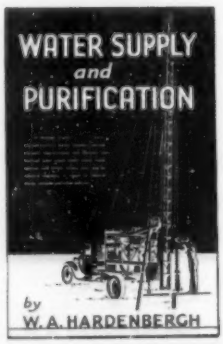
These units contain two snap action switches rated at 10 Amps.-110 Volts A.C. and can be used for either opening or closing circuits at any RPM over 350. Each switch is individually adjustable up to 2000 RPM above specified set speed.

The models shown here are designed for a two speed operation such as cutting out a starting motor circuit and providing overspeed protection with manual or automatic re-set. The dust cap is available with open terminals or a variety of standard or special connector fittings.

SYNCHRO-START PRODUCTS, INC.
Automatic Engine Control Equipment
8151 NORTH RIDGEWAY AVENUE, SKOKIE, ILLINOIS

Water Supply and Purification

by Col. W. A. Hardenbergh



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AN authoritative yet simple treatment of the subject by one of the nation's foremost authorities, whose editorial and field work have brought him in close contact with the problems that trouble the average engineer. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods.

Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintenance lines have been almost completely rewritten; the chapters on pipe conduits and on desinfection have been revised to bring the material in them up to date and a new chapter has been added on fluoridation.

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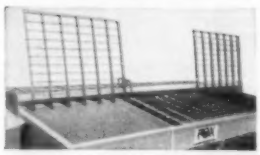
FOX Mountable Materials Spreader

for sand • cinders • chips • salt • calcium chloride

MOUNTING

On or off any standard dump body in only 15 minutes. T-head fasteners, cranks and base adjustment channels make this possible. Truck is quickly freed for other work.



LOADING

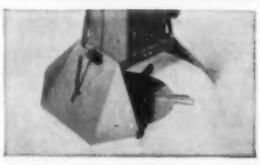
Sturdy ⅜" rods make up cover grids that break up lumps. Allow only spreadable material to pass through. Increases spreading efficiency and prevents damage to mechanism.

DASH-MOUNTED CONTROLS

Fingertip control from inside cab makes operation a one-man job. Panel includes—spreader engine ignition and starter switches, volume regulation control and electric clutch switch. Sanding at speeds up to 40 MPH.

FEED AUGER

Heavy-duty feed auger eliminates feed aprons and chains, the source of most frequent breakdowns. Auger mounted on 4 Timken tapered roller bearings, completely shielded from abrasives.



SPINNER

Adjustable for 8 to 40 foot spreading widths. Works close to ground—spreads under parked and passing cars . . . ahead and beneath rear truck wheels for added traction.

GENERAL SPECIFICATIONS

Model	Box Length	Box Width	Weight Empty	Capacity Heaped* (yards)
8S57	8′	80″	2435	5
9S57	9′	80″	2610	5¾
10S57	10′	80″	2849	6½
12S57	12′	80″	3156	8

*4", 6" and 12" height additions to box increases capacity—up to 12 cu. yds. on Model 12S57.

ENGINE —Wisconsin air-cooled, 18 H.P. @ 3500 r.p.m. with starter, generator and enclosed drive reduction.

BODY —10 gauge prime steel. All welded construction with reinforcing ribs.

BEARINGS —10 Timken tapered roller bearings and two sealed ball bearings plus engine bearings.

AUGER —Heat treated alloy steel. 7" O.D. progressive hard faced flights welded on 4" O.D. tube. Mounted on 4 Timken bearings.

CONTROLS —Manual controls outside driver's window, standard. Optional electric remote control panel on truck dash.

SPINNER —18" diameter. Height adjustable by 4 position lever for 8 to 40′ spread.

MOUNTING —Quickly attached without drilling holes or welding.

GRIDS —⅜" rods on 3" centers. 4′ and 5′ sections.

SPECIAL USES —Ideal as Seal-coater for summer road work. Special attachment converts unit to a Trench Filler.

The Fox Materials Spreader will cut your labor, time and equipment expenses to the bone. A catalog . . . case history reports . . . even a no-obligation demonstration are yours for the asking. Write, call or wire collect today. After you put a Fox Spreader into service, we'll be able to add your name to our growing list of satisfied users.

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Road Machinery Division
Dept. R3, 1020 N. Rankin St. • Appleton, Wisconsin
Phone—REgent 4-1451

To order these helpful booklets check the reply card opposite page 36.

STREET LIGHTING AND TRAFFIC CONTROL

Steel and Aluminum Lighting Standards

34. Street and highway lighting standards, floodlighting standards, traffic signal standards and arms, strain poles, brackets and mast arms and accessories are some of the units described in catalong from Kerrigan Iron Works Company, P. O. Box 479, Nashville 2, Tenn.

Non-Electric Traffic Control Products

186. Reflective pavement marking glass beads, Cataflex "202" reflective coating, Cataline reflective striping, Catatherm reflective plastic striping, plain and reflective street and highway signs, plain and reflective street name signs are covered in literature from Cataphote Corp., P. O. Box 2066, Jackson, Miss.

Street Lighting Poles for Streets and Highways

443. Standard designs, assembly details, suggested pole sizes, base construction details and bracket arm details are some of the details covered in this 22-page catalog. Check the reply card or write The Union Metal Mfg. Co., Canton, Ohio, for Catalog No. 78-A on street lighting poles of modern designs for all streets and highways.

Handbook on Aluminum Traffic Control Devices

516. Subjects covered in this handbook are sheet signs, extruded signs, sign posts, street signs, and complete specifications for many aluminum uses. A list of Alcoa sales offices is included. Check the handy reply card or write to Aluminum Company of America, Alcoa Building, Pittsburgh 19, Pennsylvania, for mounting, determining size of sign posts and other information today.

Complete Catalog on Traffic Control Equipment

240. All types of controllers, PR system of coordinated traffic control, vehicle detectors, timers, vehicle counters and radar speed meters are covered in catalog available from Automatic Signal Div., Eastern Industries Inc., Norwalk, Conn. Check the reply card.

3M Letters for Large Reflectorized Signs

374. "3M Signal" letters are made with "Scotchlite" reflective sheeting encapsulated in acrylic plastic and are used on large reflectorized signs. Check the reply card or write Minnesota Mining and Mfg. Co., St. Paul 6, Minn., for full details.

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations.

Use The Reply Card

Overlaid Plywood Makes Signs Look Better, Last Longer

541. Complete information and a sample of GPX medium-density overlaid plywood are available from Georgia-Pacific, Dept. PWM, Equitable Bldg., Portland, Ore. Check the reply card for data on this plywood for traffic signs.

Literature on Reflective Glass Beads

690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card.

Manual on All Types of Traffic Signs

379. This 26-page manual covers regulatory, warning, school, railroad, street name, road construction, route markers, miscellaneous signs and plastic reflectors. Check the reply card or write The Miro-Flex Co., Inc., 1824 East Second St., Wichita 7, Kans., for your copy.

Aluminum for Complete Line of Signs and Sign Blanks

675. Valuable information on aluminum's advantages, features and economies, plus details on application of all sign message materials are covered in the aluminum sign bulletin from Kaiser Aluminum & Chemical Sales, Inc., Dept. MU-936, 919 N. Michigan Ave., Chicago 11, Ill. Check the reply card today.

WEED AND DUST CONTROL

Chemical for Roadside Weed Maintenance

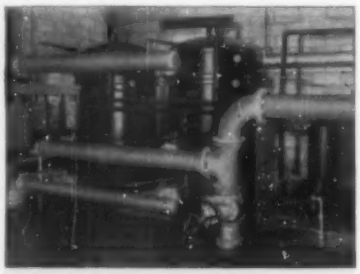
234. Garlon is an easy to prepare and to use chemical in the control of roadside weeds and growth. For complete data write The Dow Chemical Co., Agricultural Chemicals Sales, Midland, Mich., or check the reply card.

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

- BAKER PARK MUNICIPAL POOL, Frederick, Maryland, 400,000 gallons
- Filter System Design, W. R. Walter, City Engineer, Frederick, Maryland
- Filters: 2-SPF-169 R. P. Adams Company, Inc.

Shown is a typical Adams SPF Swimming Pool Filter installation. These filters are available in a wide range of sizes for pools of 50,000 to several million gallons capacity. All sizes are normally available from stock. We do not offer a filter for backyard pools.



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To order these helpful booklets check the reply card opposite page 36.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Bare Pavement Maintenance With Sterling Rock Salt

84. Handbook is designed for road maintenance men who are responsible for safe winter pavements; and is a safe-roads fact book about a modern snow and ice removal program. Check the reply card or write International Salt Co., Inc., Scranton, Pa.

Sand, Chip and Calcium Chloride Spreader For Ice Control

429. Complete specifications, performance records and prices on the Fox sand spreader are covered in literature from Fox River Tractor Co., Dept. R3, P. O. Box 469, Appleton, Wisc. Spreader can be attached or removed from most any dump truck in 15 minutes and can be operated from 5 to 40 miles per hour. Check the reply card.

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Complete Ice and Snow Fighting Equipment

523. Snow plows in 55 models and 9 types, material spreaders with width of spread of 8 to 20 ft. and hopper capacity of 2 cu. ft., and truck grader ice blades are covered in literature from Wausau Iron Works, Wausau, Wisc. Check the reply card.

Rock Salt For Ice and Snow Removal

534. Application rates and procedures of using Morton rock salt for ice and snow control are covered in catalog from Morton Salt Co., 110 No. Wacker Drive, Chicago 6, Ill. Check the reply card for Catalog F-35.

Snow Plows For Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of up to 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.

RECREATION

Heavy Duty Swimming Pool Equipment for Municipal Pools

193. Illustrated bulletin showing heavily built diving and deck equipment is available from American Playground Device Co., Anderson, Ind. Check the reply card for specifications on diving boards, data on diving stands, towers, slides, pool ladders and pool cleaning equipment.

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Commentary on Water and Sewage Treatment

SLUDGE REMOVAL From PRIMARY CLARIFIERS

R. S. RANKIN

Consultant, Water and Sewage Treatment

THIS MAY SEEM a very prosaic topic but to plant operators the removal of sludge from primary clarifiers in sewage treatment is an important operation directly affecting the efficiency of sedimentation and digestion. If too little is removed the clarifier effluent deteriorates; if too much the digester operation deteriorates. The diverse methods and facilities practiced make it difficult to standardize operation or to recognize some of the problems. It has been observed that wherever operators gather, sooner or later this topic comes up for discussion and the problems are much in evidence. Listening in on these discussions not only is an education but emphasizes the dearth of published information on the subject. Much has been written on the mechanical features of sludge pumps but in the 30 years of the Sewage & Industrial Wastes Journal and its predecessor only two or three brief articles on sludge removal have appeared. This could indicate lack of interest or absence of any problem, but it is doubtful that operators will agree to either conclusion. The subject of sludge removal from primary tanks merits an examination of the fundamentals so that designers as well as operators can avoid some of the common troubles.

The solids that settle in a primary clarifier and require removal are not solids at all to the operator but a black or grayish sticky slurry of mushy consistency. The sanitary engineer may call them solids but that term fails to convey any accurate description of their true nature. Sewage sludge probably has more variable qualities than any other material put through a pipe line. No uniform constants such as a friction factor, specific gravity, viscosity or percentage of solids can be applied to it. In short, its characteristics are as variable as the number of plants. It is little wonder that a variety of problems arise in the collection, concentration and disposal of this fraction of the sewage which seldom is over 1/200 part of the flow.

The intent of every operator is to remove the sludge with a minimum of excess water, and to do this he retains it in the clarifier as long as possible before the onset of septicity. During this storage period consolidation forces out some of the excess

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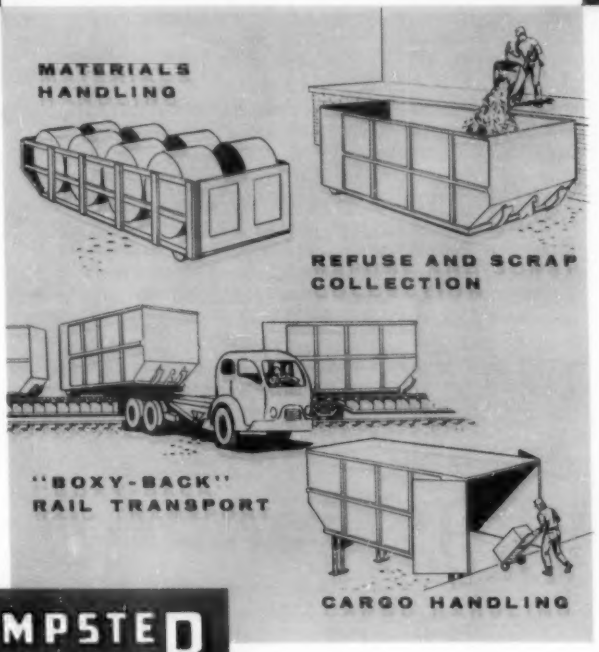

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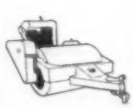

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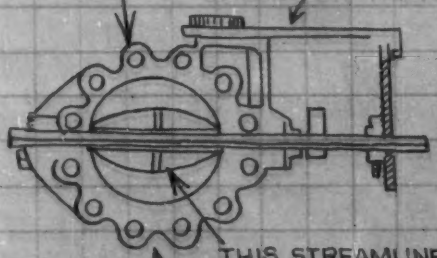

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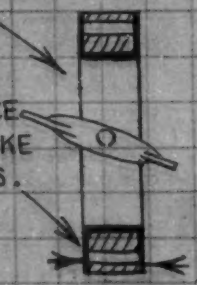

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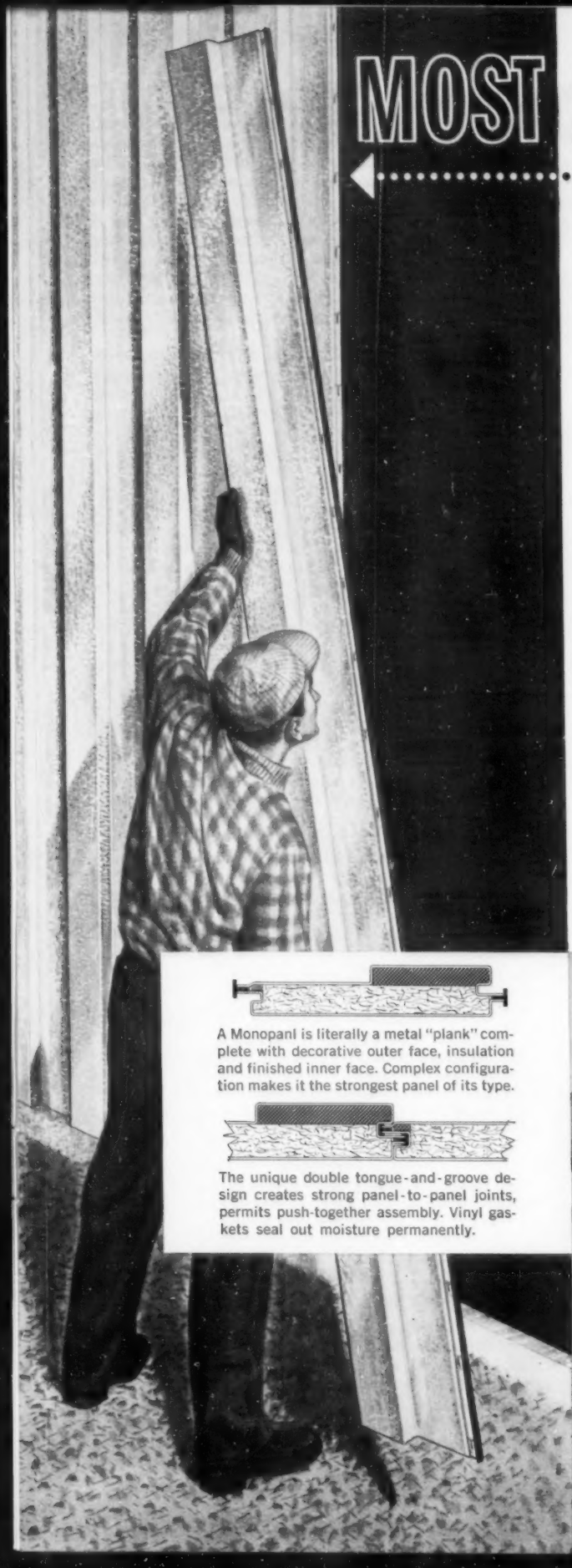
water and yields a thicker sludge, but storage also encourages septicity. However, since most sedimentation tanks now provide only a limited volume for storage, the sludge must be removed frequently and at a rate which avoids funneling through of the overlying liquid. The job is a perpetual compromise between too thick or too thin. It is evident there is more to sludge removal than pressing a starter button on a pump or lowering a decanting pipe.

Commenting on the latter method, commonly known as gravity draw-off, about the only feature in its favor is its simplicity and cheapness and, of course, some claim it provides visual means of inspection. Against it is a complete lack of any control or regulation. The sludge either remains behind in the tank or when it does flow it gushes out with excess water before it can be brought under control. By the time it is controlled the sludge has backed up into the tank and the operation must be repeated. To keep a conscientious operator happy, this method of sludge removal should be abandoned. A positive acting pump may have faults but at least the operator can control and regulate it.

One way to get thicker sludge is to increase the size of the sludge hopper considerably. When this is done the hopper must be mechanically cleaned and this adds to the cost of the equipment and the tank. Tanks with this facility have been used and found effective particularly in England, but so far they have not aroused any interest in this country. One sure way to get the thickest possible sludge out of a clarifier is by scheduling the sludge pump operation to fit the rate of sludge production.. This may seem obvious but it is surprising how many operators pay scant attention to it and instead pump the sludge entirely by the clock, such as one hour in the morning and one hour in the evening. This is like pumping sewage, for example, on a rigid time schedule regardless of flow rate. A time schedule for pumping is acceptable provided it has been based on actual conditions determined from a series of test runs and repeated as frequently as conditions change. For the average operator this means spending more time at the sludge pump than he thinks he can spare but the result will be rewarding.

Setting up a schedule for pumping the sludge in accordance with rate of production takes time and patience. In many plants this rate will vary from month to month, week to week, and even day to day. Unfortunately, there is no established means for continuous determination of the water content of the sludge being pumped except by sampling, and there is no other convenient way of getting representative samples through the entire pumping period except by collecting them at frequent intervals. One ingenious method for continuous sampling and measurement was developed by Walter A. Sperry (1) at Aurora, Illinois in 1933. It consisted of a tipping bucket device which not only measured the volume but delivered a sample at every other tip of the bucket. The sludge is pumped to the device which is high enough to discharge by gravity to the digester. So far as is known it is still operating but unfortunately only a few plants have copied it. Some day a device employing an isotope with probing rays may be developed to measure the density of a moving column of sludge.

In the absence of automatic facilities, there is a simple tested method of setting up a pumping schedule. All plunger sludge pumps have a sampling cock on the discharge side and, of course, it



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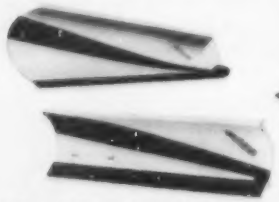

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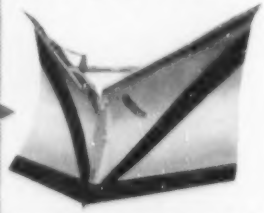

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should be high enough off the floor to put a receptacle beneath it. The method consists in collecting a series of samples at regular time intervals in glass jars and then setting them aside for observation ranged in order of time of collection. After an interval of 15 minutes samples with 50% or more supernatant above the sludge level indicate that too much was pumped. The time to stop pumping should be just before this condition was reached. Laboratory determinations can check the results and, of course, some value other than 50% may be the criterion for a particular plant. Frequent repetition of this test will aid in establishing pumping schedules which match the rate of production.

Many operators probably wonder why be concerned about a little excess water just so they get the sludge out of the clarifier. The reason is to avoid sending the excess to the digester and have it return as supernatant. A sludge with 4% solids contains 25% more water than one at 5%. Thus a 5% sludge means less pumping time, less volume going to the digester, and less supernatant return. The digester will behave better and its capacity will serve longer. The best way to get thick sludge is to make frequent sampling runs and set the time of operation accordingly. A time clock to turn the pump on and off is a labor saver providing the schedule is regularly checked and adjusted to the changing solids load.

In calculating the solids going to the digester, sludge pumping measurements are frequently used. While the operating time can be determined accurately other errors can cast doubt on the results. The pump capacity is subject to some though not serious error, and this can be detected by meter or calibration. The error that can be considerable is in the computed solids content. The best way to check this is to compare the total weight of dry solids removed as sludge with the total removed as suspended solids. Since the first is calculated as total solids, it should be somewhat greater than the suspended solids. Again, if total solids in the plant influent and effluent are analyzed, the removals should check with the solids removed as sludge. They rarely do check but that does not mean the method is wrong. Errors creep in because of inaccuracies of measurements, and the more attention paid to details the better will the results check. This is another means of attaining the maximum plant efficiency, namely by checking solids input and output with the quantities removed.

Sludge removal operations at a plant are important and require patience and skill for best results. These are problems too which, if publicized, will aid in getting corrective measures designed into plants. It is hoped that operators will continue to gather and discuss their problems.

Reference

(1) Tipping Bucket Sludge Meter, Walter A. Sperry, Sewage Works Journal, Vol. 6, 1934, Pg. 797

• • •

Illinois Water Supply Conference

The Water Resources Committee of the Illinois State Chamber of Commerce will sponsor its 3rd annual state-wide Water Supply Conference with the theme "Water for Industry." The meeting will be held in Springfield, Ill., Aug. 27. More data from J. G. Ronuchetto, Secretary, Water Resources Committee, 20 N. Wacker Drive, Chicago 6, Ill.

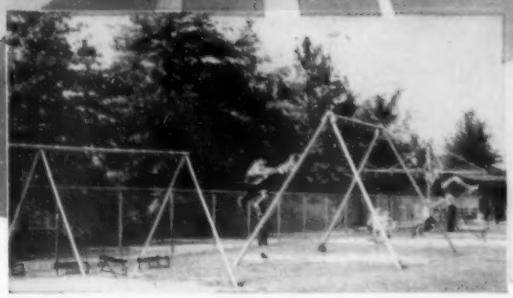
RUST-OLEUM®

STOPS RUST!®

and beautifies as it protects in many attractive

COLORS

Distinctive as your own fingerprint. Accept no substitute.



Why let rust mar your park and playground equipment? Rust-Oleum *Stops Rust!* – and beautifies swings, slides, merry-go-rounds, fences, receptacles, buildings, power equipment, etc. Easy to apply by brush or spray, and dries to a firm, decorative coating that resists sun, moisture, heat, fumes, rain, snow, and weathering! Your nearby Rust-Oleum distributor maintains complete Rust-Oleum stocks in all colors for prompt delivery. Clip coupon to your letterhead for complete information and FREE TEST SAMPLE of Rust-Oleum 769 Damp-Proof Red Primer, *today!*

ATTACH COUPON TO YOUR LETTERHEAD FOR FREE TEST SAMPLE

RUST-OLEUM CORPORATION

2682 Oakton Street — Evanston, Illinois

Gentlemen: Please send me a FREE TEST SAMPLE of Rust-Oleum 769 Damp-Proof Red Primer for application over sound rusted surfaces, and complete information on the following:

- ☐ New 36-page catalog showing Rust-Oleum colors and applications.
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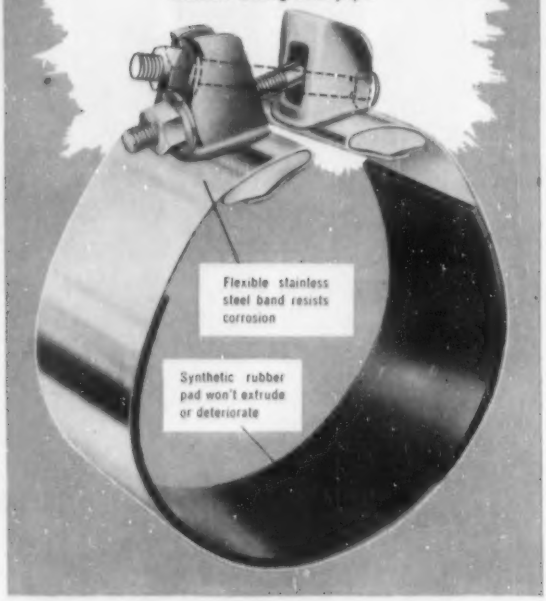
- ☐ Nearest source of supply.

MARMAN Heavy-Duty
PATCHMASTER
PIPE REPAIR CLAMP

NEWLY DESIGNED
PIVOT-ACTION LUG
tightens to pipe contour
without biting into pipe



Repair all pipe leaks quickly, safely with this new Heavy-Duty PATCHMASTER. It's designed to conform to pipe under high torque—*without biting into the pipe!* Completely corrosion resistant, the PATCHMASTER can be used on oil, gas, water and steam lines. Cut costly equipment downtime. Have Marman PATCHMASTERS on hand. Sizes for ½" to 8" pipe. See your distributor, or write us.

Emergency temporary repair of pipe leaks can be made with ease, yet the PATCHMASTER will stop leaks permanently.

PATCHMASTER is an Aeroquip Trademark.

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Marman Products are Covered by U.S. and Foreign Patents and Other Patents Pending

Automatic Equipment for Rainfall Studies

Nine drainage areas, located in both urban and mountainous regions of Los Angeles, Calif., have been equipped with automatic rain gages, automatic stage recorders, and/or manually operated standard rain gages. The rainfall records from the mountainous areas, obtained from sites distributed over the Santa Monica Mountains, are used to evaluate the varying rates of rainfall-runoff from the many canyons, whose storm water flows pass through lower, well-developed urban areas of the City. The runoff from other drainage areas, both urban and mountainous, is obtained by the use of staff and stripe gages, the former being located in streets and open streams, and the latter located in closed storm drains. These gages are painted with a readily soluble yellow dextrine paint, which is dissolved and washed away by the passage of storm water, leaving a positive high water record for reference purposes.

Analysis of the data from these several types of gages, when correlated and supplemented with records of similar work from other local organizations, gives data from which the following information can be developed: 1) runoff coefficients; 2) time of concentration; 3) storm travel; 4) storm pattern; 5) storm frequencies; 6) precipitation isohyetals; 7) efficiency of the drainage system; and 8) depth of flooding resulting from inadequate drainage facilities.

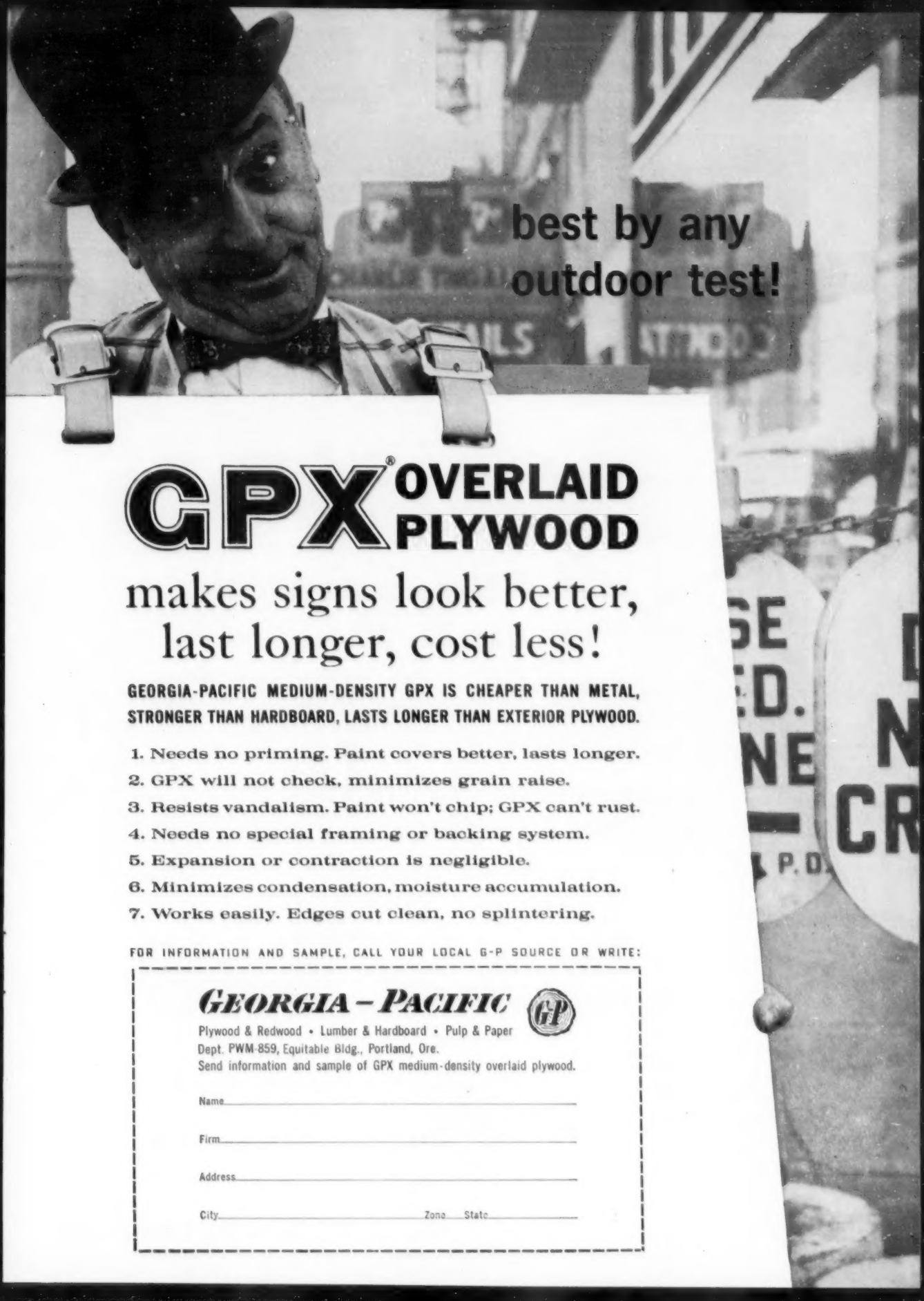
The work of servicing, repairing, and reading, nine automatic stage recorders, fifty-four high water gaging stations, and forty-two standard and automatic rain gages, together with the assembly and analysis of the data obtained therefrom, is an important function.

Michigan Launches Safety Campaign in Road Construction

The Michigan State Highway Dept. has launched a safety campaign designed to reduce the cost of accidents to highway construction workers by an estimated $2.5 million in the next few years. Highway Commissioner John C. Mackie said that starting in June, highway construction bid proposals will detail safety precautions to be required of contractors during performance of construction work. These requirements were not previously listed. The contractor will be required to comply, and his future prequalification or bidding privileges will be determined, in part, on how well he complies with the new safety program. Highway construction accidents, aside from the human suffering involved, cost an average of $31,000 per one million dollars worth of construction awards.

Lime Road Stabilization Gains Rapidly

According to a recent survey by the National Lime Association, hydrated lime enjoyed its peak year in 1958 when awards reached 20,100,000 sq. yd. of roads, airport runways, and parking areas. This amount, equivalent to 1435 miles of 24-ft. width pavement, represents a 33 percent increase over 1957, when total awards were about 13,100,000 sq. yd. These figures include lime-pozzolan mixtures in addition to straight lime-soil combinations. Approximately 240,000 tons of lime were involved in the 1958 awards. A breakdown is as follows: Interstate system 5,900,000 sq. yd.; primary roads 7,060,000 sq. yd.; secondary roads 2,592,000 sq. yd.; airport runways 1,385,000 sq. yd.; city streets 290,000 sq. yd.; private work 950,000 sq. yd.; and maintenance 1,923,000 sq. yd.



GPX® OVERLAID PLYWOOD

makes signs look better, last longer, cost less!

GEORGIA-PACIFIC MEDIUM-DENSITY GPX IS CHEAPER THAN METAL, STRONGER THAN HARDBOARD, LASTS LONGER THAN EXTERIOR PLYWOOD.

1. Needs no priming. Paint covers better, lasts longer.
2. GPX will not check, minimizes grain raise.
3. Resists vandalism. Paint won't chip; GPX can't rust.
4. Needs no special framing or backing system.
5. Expansion or contraction is negligible.
6. Minimizes condensation, moisture accumulation.
7. Works easily. Edges cut clean, no splintering.

FOR INFORMATION AND SAMPLE, CALL YOUR LOCAL G-P SOURCE OR WRITE:

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Plywood & Redwood • Lumber & Hardboard • Pulp & Paper
Dept. PWM-859, Equitable Bldg., Portland, Ore.
Send information and sample of GPX medium-density overlaid plywood.

Name_____

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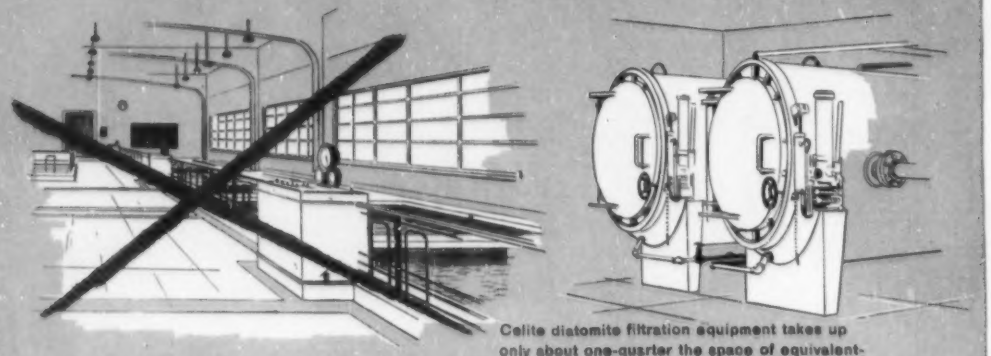
City_____ Zone____ State_____

1. REDUCE FILTER HOUSING SPACE 75%



Celite diatomite filtration equipment takes up only about one-quarter the space of equivalent-capacity sand filter systems.

2. USE LOWER-COST CONSTRUCTION

Smaller floor space needed for diatomite filtration permits lighter, lower-cost building methods and materials.

You save filtration construction dollars these 2 ways with Celite diatomite

One installation after another proves you need about 75% less filter housing space for equivalent capacity when you use diatomite filtration with Johns-Manville Celite*.

Also, diatomite's lighter, smaller equipment permits you to use lower cost building methods and materials. For example, a simple concrete slab with light framing and siding instead of a large reinforced concrete-and-brick building with built-in concrete filters#.

Diatomite filter equipment is so compact because it provides a much larger filter surface in proportion to size of equipment. In many cases, raw water can be filtered directly—pretreatment facilities can be eliminated. For Celite removes more suspended solids, including amoebae and algae, and turbidity is usually much lower.

Mined by Johns-Manville from the world's largest and purest commercial diatomite deposit, Celite is carefully processed for purity and uniformity. It is available in a wide range of grades for best practical balance of clarity and flow rate with any suitable filter. For further information, see your nearby Celite engineer. For free technical reprints and illustrated brochure, write to Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ont.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

#*See Comparison Studies of Diatomite and Sand Filtration* by G. R. Bell, Journal American Water Works Association, September, 1956 or write for free reprint.

JOHNS-MANVILLE

Absolute Rigidity Means

. . . longer tool life

. . . perfect connections

Rigidity on the main . . .

Widely spread chain hook washers of the new B-100 are deeply recessed in yoke—cannot slip off when used on large diameter pipe. Unique design of chain hook keeps chain from twisting while tightening. They all add up to absolute rigidity on the main—machine cannot move during drilling, tapping or inserting operations. Broken tools and leaky connections are eliminated.

Rigidity in the boring bar . . .

Three widely spaced boring bar bearings, two in the feed sleeve and one at extreme bottom of boring bar, assure perfect boring bar alignment. Molded nylon lower bearing supports drill when it first contacts the main. Pipe curvature cannot deflect drill—tools give longer effective life. These three boring bar bearings guarantee perfect centering of tool and stop, assuring a pressure-tight connection.

These are only a few of the many advanced features of the new Mueller B-100 Drilling, Tapping and Inserting Machine. They are typical, however, of the attention to detail in research, design and engineering that become a part of every Mueller product used by the water industry.

MUELLER®
B-100 Machine

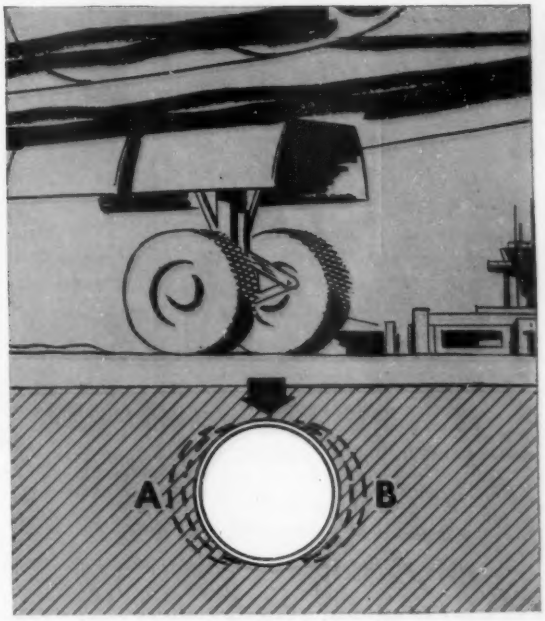
MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Why the thin sidewall of a Beth-Cu-Loy

A 28-ft., 16-gage Beth-Cu-Loy sheet steel culvert demonstrates its ability to flex longitudinally. This illustrates how Beth-Cu-Loy drainage structures can easily be made to conform to curves and changes in grade.

culvert pipe is the secret of its strength



Exaggerated for clarity, this drawing shows action of Beth-Cu-Loy pipe under load. Pressure against fill, at points A and B, sets up counter-loads which largely offset the forces through the vertical axis.

Looking head-on at a drainage structure made from galvanized corrugated Beth-Cu-Loy steel sheets, you might wonder how those thin sidewalls can support the load. Yet that very thinness gives Beth-Cu-Loy pipe one of its strongest advantages: flexibility.

Pipe made from Beth-Cu-Loy is flexible both transversely and longitudinally. Because of the latter, easy curves in the line can be made without special fittings or connections. But its transverse flexibility is even more of an advantage.

Makes Use of Surrounding Material

Because of this flexibility, a culvert or drainage pipe made from Beth-Cu-Loy sheets can make use of the surrounding material to support imposed loads. In the drawing above, for example, the load produces controlled deflection in the pipe. As points A and B move into and compact the trench walls, a load begins to develop around these points, spreading the pressures peripherally. Thus flexibility accounts in large part for the ability of corrugated steel pipe to carry the load.

Not so with rigid pipe of the type used for drainage. It cannot flex with the load, thus cannot transfer a significant portion of the forces to the surrounding material. The bulk of the pressure is exerted through the vertical axis of the pipe.

Bethlehem furnishes galvanized corrugated Beth-Cu-Loy (copper-bearing steel) sheets to fabricators who make culvert pipe and other drainage structures. Beth-Cu-Loy meets the specs of the AASHO. For full details, just get in touch with the nearest Bethlehem sales office, or write to the address shown here.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

engine power
BY CATERPILLAR

Cat Engines solve Hartford's flood problem

Flood control makes possible new industrial area

THE CITY IS SAFE behind solid dikes that keep the Connecticut River in its place. But excess runoff behind the dikes must be pumped out of the lowest areas and into the river. Pumping has to start when the river reaches 8 feet. Dependable Caterpillar diesel power handles the job and keeps industry dry.

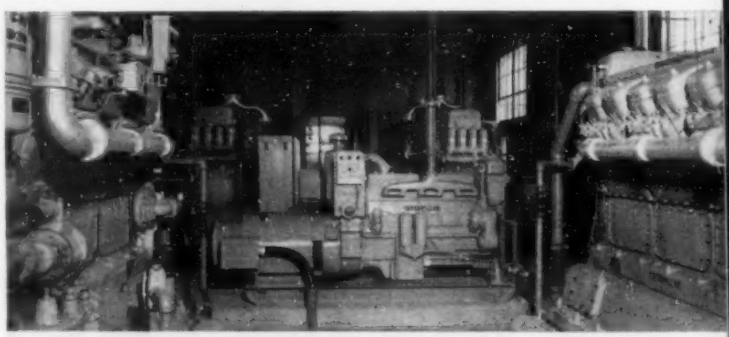
It wasn't so much the river as the land that was causing trouble in North and South Meadows—the lowest sections of land around Hartford, Connecticut.

Five miles of dikes restrained the Connecticut River. They offered protection against a river depth up to 45 feet. But this didn't keep the Meadows dry. Excess water falling within the Hartford area drained into these two areas. And the existing pumping stations couldn't handle all the water—they had a total capacity of only 108,000 gallons per minute. They needed to move a minimum of 216,000 gpm.

The situation was serious not only because it involved lives and property, but because Hartford wanted to develop North and South Meadows as Industrial Park Zones in order to bring new industry into the area.

The Caterpillar Dealer Engine Specialist worked closely with the city to solve the problem—with the help of Cat Diesel Engines. By installing 10 Cat D397 Diesels to drive the existing pumps at higher speeds, Hartford was able to boost pumping capacity to 375,000 gpm, which gives them a comfortable factor of safety.

Wherever *you* need a supply of power—mechanical or electrical—that you can count on day in and day out, in any emergency, select a Cat Diesel or Cat Electric Set. They are easy to operate, require very little maintenance, are simple and sturdy in design. Write for more details and free literature. Or call in the local Caterpillar Dealer Engine Specialist.



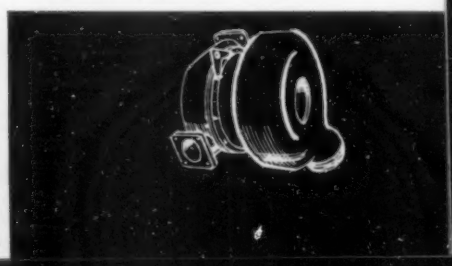
10 WORK LIKE 21. 10 powerful Caterpillar Diesels, like these (engines to left and right in photo), pump over 3 times as much water as 7 engines previously used on the same pumps. They solve Hartford's problem of keeping a new industrial area free from flooding. Dependable Caterpillar Engine Power (center engine) is used to provide standby electric power, too, to operate air compressors, floodgates, lights, heating and other services.

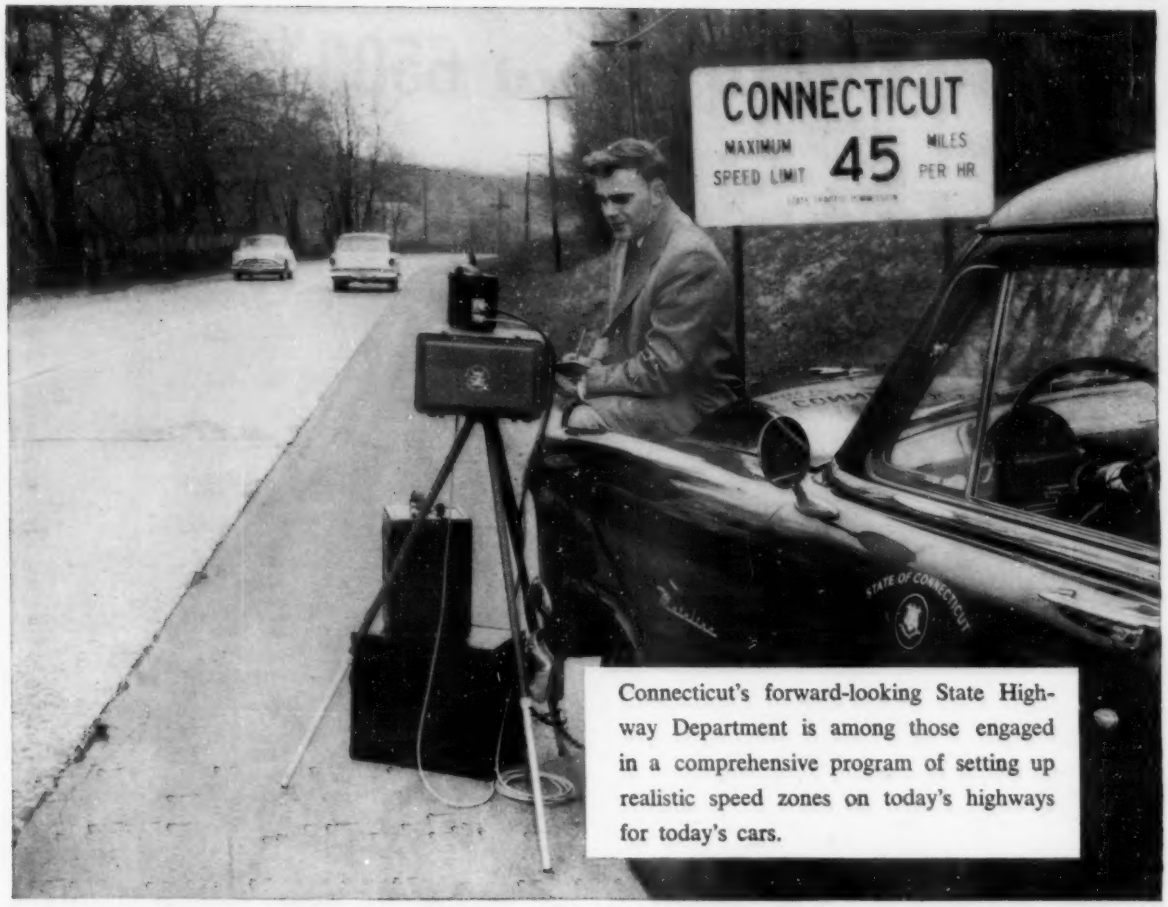
Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

KNOW HOW. Your Caterpillar Dealer Engine Specialist will help you select the right equipment and help you with installation.

LOW FUEL COST. Caterpillar Engines don't require expensive diesel fuels, work fine even with No. 2 furnace oil. They burn fuel more completely, to save you money.

MORE POWER. Turbocharging, available on most Cat Engines, gives you more horsepower per pound of weight . . . improves engine efficiency.





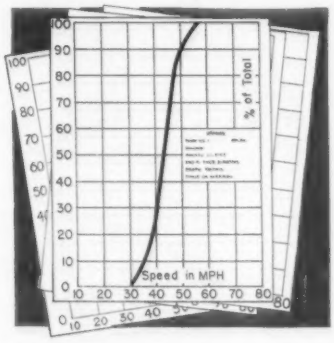
Connecticut's forward-looking State Highway Department is among those engaged in a comprehensive program of setting up realistic speed zones on today's highways for today's cars.

ELECTRO-MATIC® RADAR assures realistic speed limits . . .

The first essential in the process of setting zone speeds is the determination of current speed patterns. The Electro-Matic Radar Speed Meter is now the accepted means by which traffic engineers obtain speed characteristics of vehicle flow on all types of highways.

Highly accurate under all conditions of traffic and weather, it is inconspicuous and operates without contact-making devices on the road surface. The Meter is easily portable and requires only one man for operation. It can be set up in less than three minutes. Operation is on 6 Volt or 12 Volt battery or 120 Volt A.C.

A Graphic Recorder provides a permanent record for study and analysis leading to the preparation of speed distribution curves and other data essential to instituting a realistic system of speed zoning that goes hand in hand with modern enforcement techniques.



For more information on the Radar Speed Meter, request Bulletin R-112

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AUTOMATIC SIGNAL DIVISION

EASTERN INDUSTRIES, INC., NORWALK, CONN.

Completely New 6500-lb. capacity CASE® W-10 TERRALOAD'R®...

WORLD-FAMOUS CASE DIESEL gives you better performance, greater economy

The W-10 was engineered to take *full advantage* of the tremendous power developed by the famous Case 401-cu. in. diesel engine . . . field-proven by over 12,000,000 hours of operation on all types of jobs in all climates, the world over.

★ **POWRCEL combustion** — gives greater fuel economy, cleaner burning, smoother running . . . plus direct 24-volt electric starting.

★ **Six-point fuel filtration** — plus dry-type air filter which reduces dirt intake more than 90% over oil-bath cleaners.

★ **Extra-heavy, ribbed engine block** — gives more rigid engine, reduces flexing and results in less internal wear . . . increases usable HP and lengthens engine life.

★ **Heavy-duty 7 bearing crankshaft** — with 116 sq. in. of bearing surface . . . more than any other engine in its HP class.

★ **Pressurized cooling** — for uniform temperature. Controlled circulation lengthens valve life.

★ **Multiple cylinder heads** — prevent warping, make servicing easy.

★ **Diesel economy** — operates for pennies an hour, on a minimum of low-cost diesel fuel.

BRIEF SPECIFICATIONS

Carry capacity (4 MPH)	6,500 lbs.
Lift capacity (0 MPH)	13,000 lbs.
Max. HP	100
Forward speeds (3)	0 to 23 MPH
Reverse speeds (3)	0 to 23 MPH
Tires (std.)	16.00 x 24 — 12 ply
Overall height	7'3"
Width over hubs	94½"
Turning radius	20'
Weight (without tire fill)	18,120 lbs.

...totally balanced for:

GREATER WORK OUTPUT

Balanced power-to-weight ratio... exactly the right combination of engine power, traction and machine weight... insures top all-around efficiency... with minimum wheel slippage, maximum fuel economy.

FASTER, SMOOTHER OPERATION

Balanced weight distribution, with 60% of empty weight on rear wheels, provides greater ground-gripping traction. No bucking or raising rear wheels off ground. This, combined with torque-converter drive and powerful breakout, gets heaping loads fast. New power-shift linkage gives more efficient control of operating speeds.

LONGER LIFE

Case balanced construction results in less strain on engine and transmission, less wear on tires. All-welded channel subframe, heavy steel axles and cross-braced loader assembly provide maximum strength and rigidity.

EASIER SERVICING

Brake, electrical and steering systems are all easily accessible by merely removing front cover plate. Multiple engine cylinder heads and removable wet-type sleeves permit servicing without pulling engine.

SAFER HANDLING

Note that the W-10 loader arms are pivoted *ahead* of operator. This exclusive feature gives unequalled visibility, plus maximum operator safety. Better weight distribution, low center of gravity and wide-tread stability mean greater safety and permit moving bigger loads at higher speeds... less bouncing and tipping.

LOWER COST

With all its advanced features, the W-10 is priced *lower* than its nearest competitor. That's because Case builds the entire machine. Unit construction also means one warranty, one service source... no split responsibility.

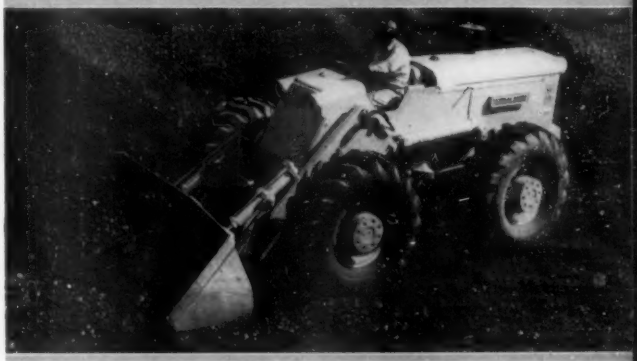
CASE®

J. I. CASE CO., RACINE, WIS.

See how the W-10 can cut your costs on jobs like these... ASK FOR A DEMONSTRATION

LOADING AND STOCKPILING

STREET AND ROAD MODERNIZATION



HANDLING BULK MATERIALS

J. I. CASE CO., Dept. No. H1349, Racine, Wis.

☐ Send more information on new W-10 Terraload'r

Also send literature on

☐ 3000-lb. cap. W-5 Terraload'r ☐ 6000-lb. cap. W-9 Terraload'r

☐ Crawler tractor-shovels .... cu. yd. cap. ☐ Crawler dozers

☐ Have nearest dealer call

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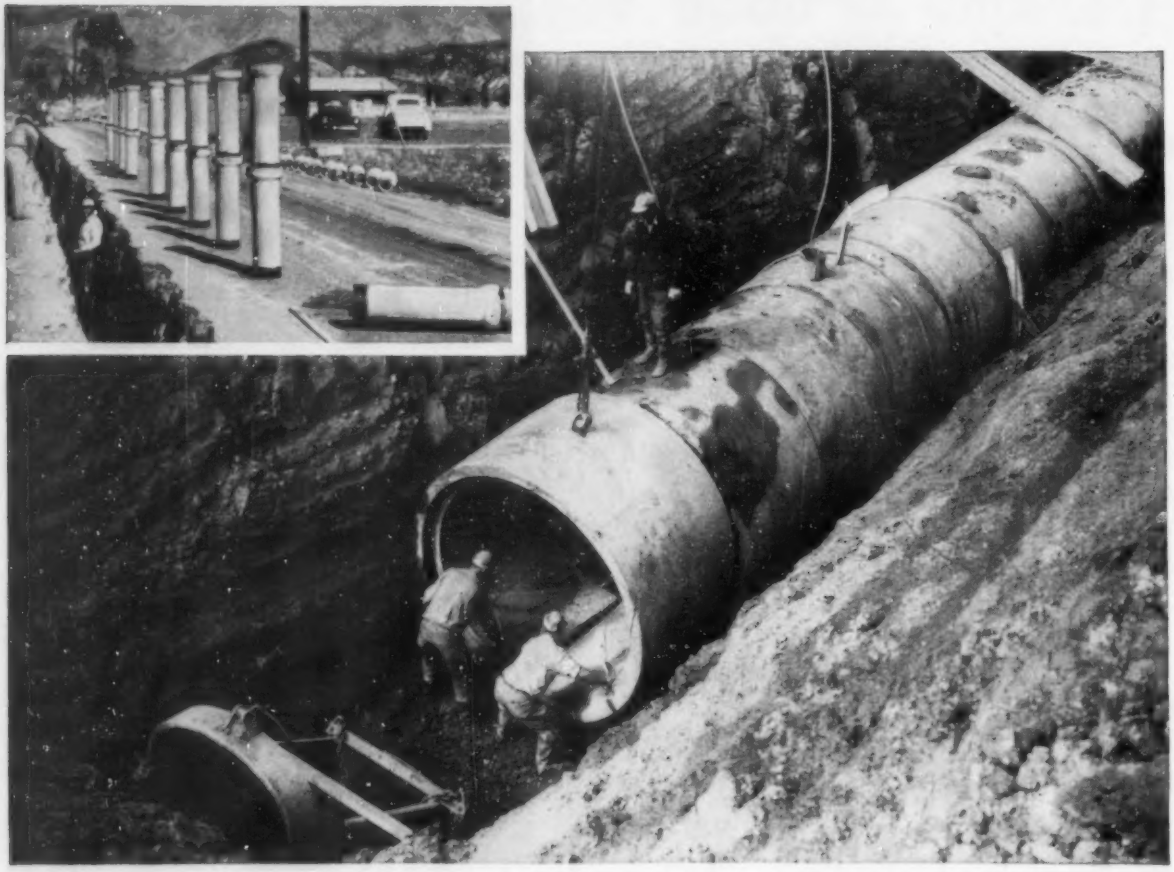
C-TL-357

From the smallest laterals to the largest interceptors . . .



concrete pipe provide maximum strength and long life at low cost

Throughout the country thousands of miles of concrete pipe sewers—some built as long ago as 1842—demonstrate concrete's outstanding strength and durability. Strong right from the start, concrete actually grows stronger with age!

Concrete pipe can be accurately designed for any depth of backfill and surface loads. With modern manufacturing methods, a life expectancy of 100 years is reasonable for today's durable concrete pipe.

And concrete pipe never warp out of shape. This allows uniform space for jointing materials, assures tight joints that prevent root penetration and keep infiltration to a minimum. Smooth, hard interior walls resist abrasive wear, give high hydraulic capacity.

Readily available, concrete sewer pipe is most economical. It can be made with local labor at or near the job site from materials produced nearby. All good reasons why more municipalities are building more miles of concrete pipelines every year. Write for free literature, "*Concrete Sewer Pipe for Economy and Service.*" Distributed only in the United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. A8-89, 33 West Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete

GO MODERN

with the world's newest mercury luminaires from General Electric

New beauty, efficiency, safety for every street and highway

GENERAL ELECTRIC

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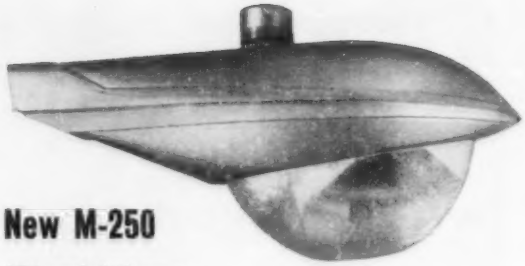
with General Electric's new mercury luminaires



New M-250

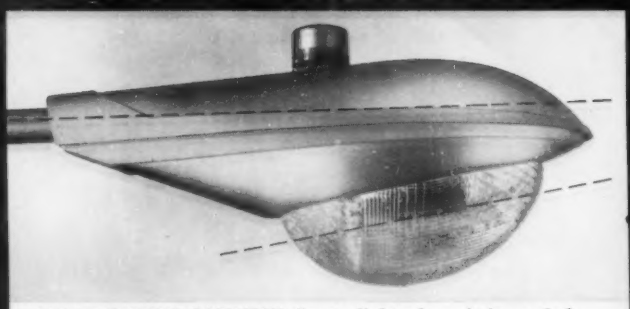
175 and 250 watt
residential and light-traffic streets

Get top efficiency, new modern

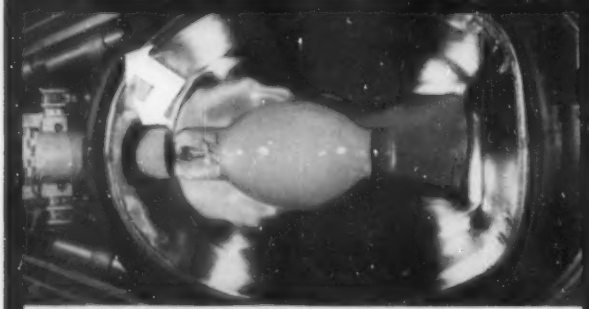
POWER PACK built-in ballast saves $50-75 per unit during installation—175- to 1000-watt sizes.

TERMINAL BOARD allows quick hook-up with two clamp-type screws; eliminates splicing, other interconnections.

UNIVERSAL SLIPFITTER easily adjusts for 1¼- or 2-inch brackets. Requires no additional parts.

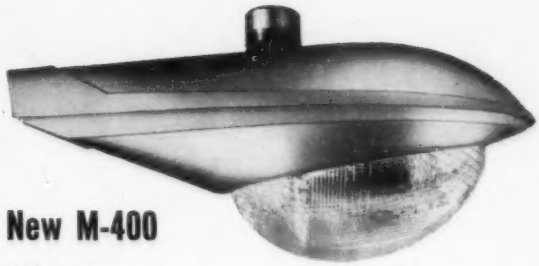


TILTED OPTICAL ASSEMBLY directs light where it is needed, contributes to graceful styling.



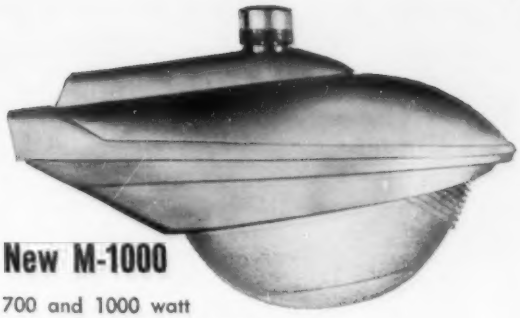
SEALED OPTICAL ASSEMBLY—silicone rubber gaskets block entry of bugs and dust, reduce cleaning.

UNIT PHOTOELECTRIC CONTROL with dependable new G-E cadmium sulphide cell locks on top of unit.



New M-400

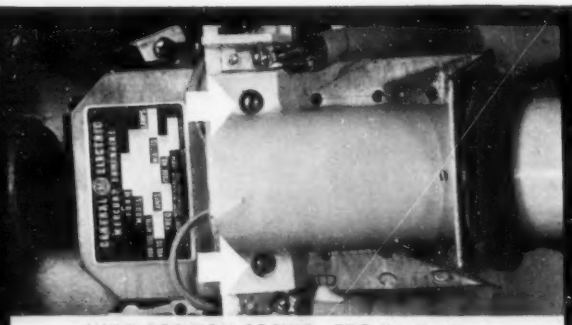
400 watt
business and traffic streets, highways



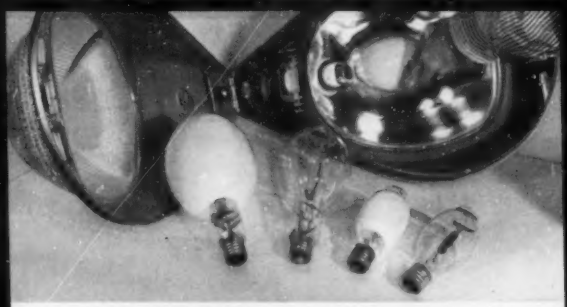
New M-1000

700 and 1000 watt
whiteways and shopping centers

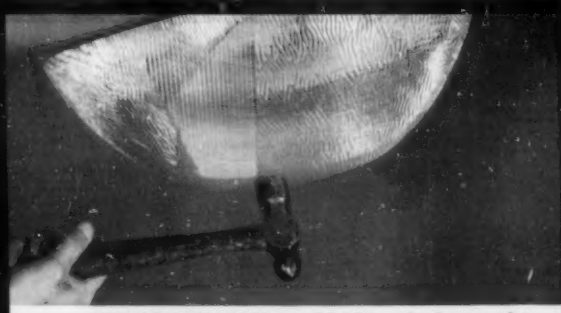
styling, plus these extra values



MULTI-POSITION SOCKET—IES distribution types are easily selected by simple screw adjustment.



LAMP FLEXIBILITY—complete lamp selection—clear, white, color improved, 175 to 1000 watts.



ACRYLIC REFRACTOR on M-250 unit, heat-resistant glass refractors on other units, cut breakage.

Smart styling . . . unequalled efficiency . . . economical operation . . . all are yours with new General Electric mercury luminaires. And, for the first time you'll find ratings for every street and highway *in a single design family*. 100% designed by General Electric — with components engineered to work together—this new mercury line delivers these major user benefits:

Unparalleled photometric performance – Precisely contoured reflector and proven prism design give optimum light output and control.

Unequalled electrical efficiency – Built-in "Power Pack" ballast, first introduced by G.E., provides lowest "watts loss" in the industry; available in all ratings.

Wide flexibility–IES distribution types may be selected by simple movement of adjustable socket. Mount on either 1¼- or 2-inch bracket with universal slipfitter.

Low installation and maintenance costs–Easy access to all components, convenient two-connection pre-wired terminal board for wiring, unitized construction make installation simple. Long-life ballast, positive gasketing, heat-resistant glassware minimize maintenance.

Get full information from your General Electric Apparatus Sales Engineer or Agent today or use the coupon below.

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Section D450-5, General Electric Co., Schenectady 5, N. Y.

Please send me free bulletins on the subjects checked below:

☐ New Mercury Luminaires, GEA-6943

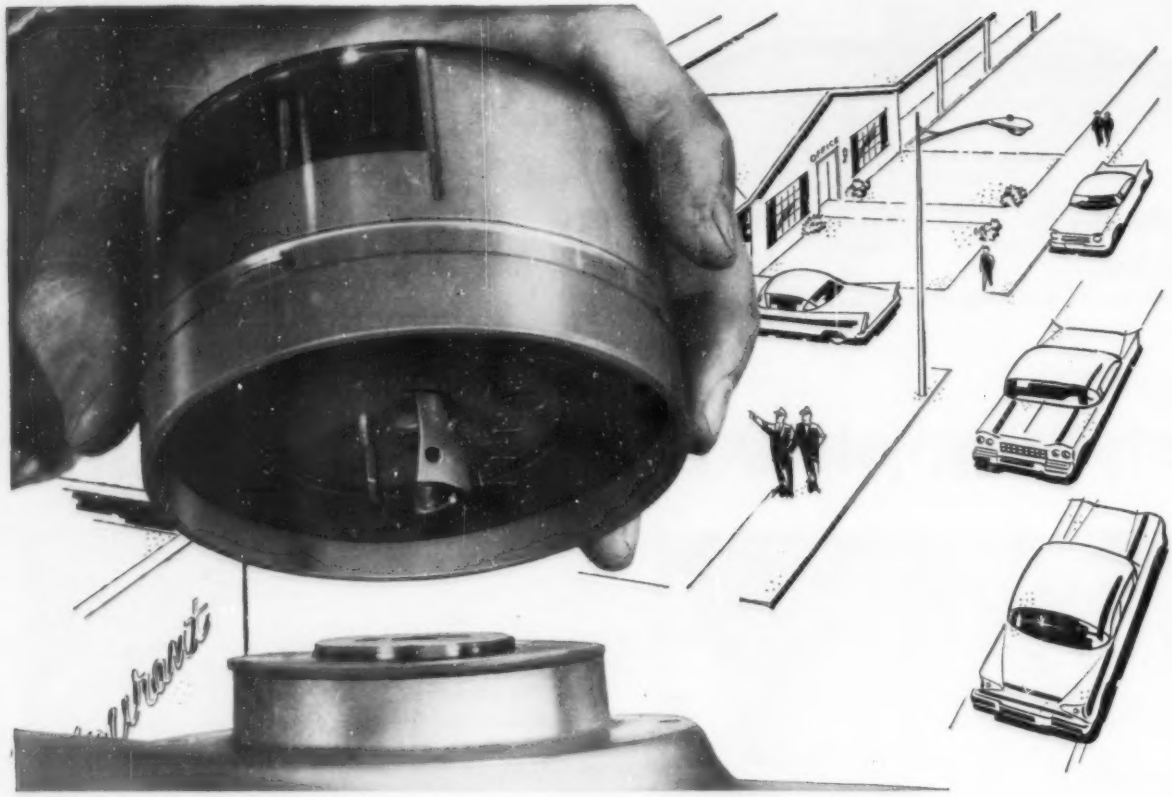
☐ Cadmium Sulphide Photoelectric Control, GEA-6987

Name_____

Company_____

Street_____

City_____ State_____



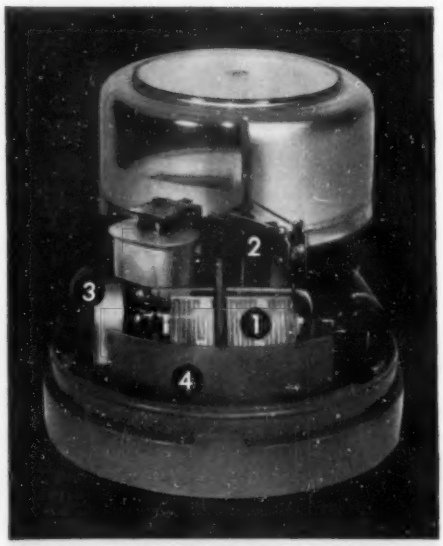
Reliable—after years of tests

New G-E cadmium-sulphide control installs in seconds . . . lasts for years

Now, from General Electric comes the industry's newest, most dependable cadmium-sulphide photoelectric control. Years have been spent in the research, design, and testing of this new street lighting control to produce the most efficient, most reliable cadmium-sulphide control available. Now, after exhaustive testing, the reliability problem has been solved with a custom-built General Electric cadmium-sulphide cell. Shock, surge, humidity, vibration, load, temperature—these were among the tests conducted —but none was found to alter the dependable performance of the new G-E control.

Addition of the new cadmium-sulphide cell is but part of the story. General Electric has developed a new, simplified circuit with specially-engineered long-life components . . . designed and built to work together and to reduce your control costs.

Get the full details from your General Electric Apparatus Sales Engineer or Agent, or write Section 450-25, General Electric Company, Schenectady, New York.



ADVANCED DESIGN FEATURES give: (1) dependability from new G-E hermetically sealed cadmium-sulphide cell; (2) long life from specially-engineered components; (3) built-in protection from voltage surges; (4) power savings through accurate external adjustment. NO VACUUM TUBES OR RECTIFIERS.

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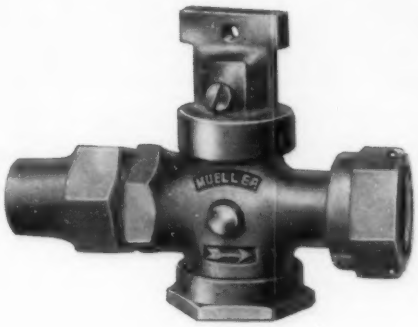
For easy-to-make, leak-proof settings...

3 NEW MUELLER® meter stops!



H-14300 Inverted Key Meter Stop

"Service to meter" stop
Connects directly between service line and meter
Inlet connection for ¾" copper service pipe
Swivel nut outlet for ⅝" x ¾" or ¾" meter
Round way, inverted key curb stop design
Combined Cap and Tee Head with Check

H-14313 Inverted Key Meter Stop

"Meter to house" stop
Connects directly between meter and house piping
Swivel nut inlet, Inside I.P. outlet

Size of Stop	¾"	1"
Size Meter Spud thread	⅝" x ¾" or ¾"	1"
Size Stop outlet	¾"	1"

Round way, inverted key construction
Phosphor bronze spring in base for easy turning
Base cap sealed with "O" ring
Combined Cap and Lever Handle with Check

H-14325 Angle Meter Stop

"Service to meter" angle stop
Connects directly between vertical service line and meter
Provides elbow to set meter horizontally at any convenient height
Angle inlet connection for ¾" copper service pipe
Swivel nut outlet for ⅝" x ¾" or ¾" meter
Straight way, ground key construction
Solid Flat Head with Lock Wing

These special application meter stops are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product manufactured for the water industry. Write for complete information on the full line of Mueller meter stops and other meter setting equipment.

MUELLER CO.
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Factories at: Decatur, Chattanooga, Los Angeles;
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more than a tractor-shovel

PAYLOADER® and its attachments work for you the whole year through

When you invest in a "PAYLOADER", you get *more* than a tractor-shovel . . . you have a potential *fleet* of construction and maintenance equipment to handle, not only the regular tractor-shovel jobs, but scores of specialized jobs normally requiring single-purpose machines.

Widest Range of Tools

A "PAYLOADER" can be equipped with a greater variety of proven attachments than any other tractor-shovel, each tool specifically and exclusively engineered for the "PAYLOADER" applications. They are easily and quickly installed and many permit the use of the bucket in conjunction with the attachment. Only a "PAYLOADER" offers you this maximum versatility, productivity and economy.

Reduces Your Equipment Investment

With one basic machine that does scores of different jobs, you eliminate the big investment in various single-purpose machines. A "PAYLOADER" will handle these specialized jobs equally well, and then can be quickly converted back into a shovel or to another useful attachment. And you can keep your "PAYLOADER" busy more days in the year.

For the Snow Belt

For snow fighting alone, there are several attachments from which to choose: regular or special-large snow buckets; self-powered rotary plow; powerful drift-busting "V" plow; "one-way" and reversible blade plows.

Four-In-One Bucket

A "PAYLOADER" equipped with a patented Drott 4-in-1 bucket has no end of uses for public works, because it can function as a shovel, bulldozer, clamshell or self-loading scraper. This special bucket is available only on a "PAYLOADER" in the rubber-tired field.

Other Useful Attachments

Some of the many other "PAYLOADER" attachments of special interest to public works departments include the back-hoe, the pick-up sweeper, a high-capacity leaf loader, a blacktop spreader, a side-boom, and a vibratory compactor.

Wide Range of Sizes

Proven "PAYLOADER" tractor-shovels are available in a wide range of sizes to fit the requirements of any public works department, and they are backed by the largest, most experienced network of distributors in the industry.

THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Ill.

Send literature on the complete "PAYLOADER" line and attachments

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THE FRANK G. HOUGH CO.
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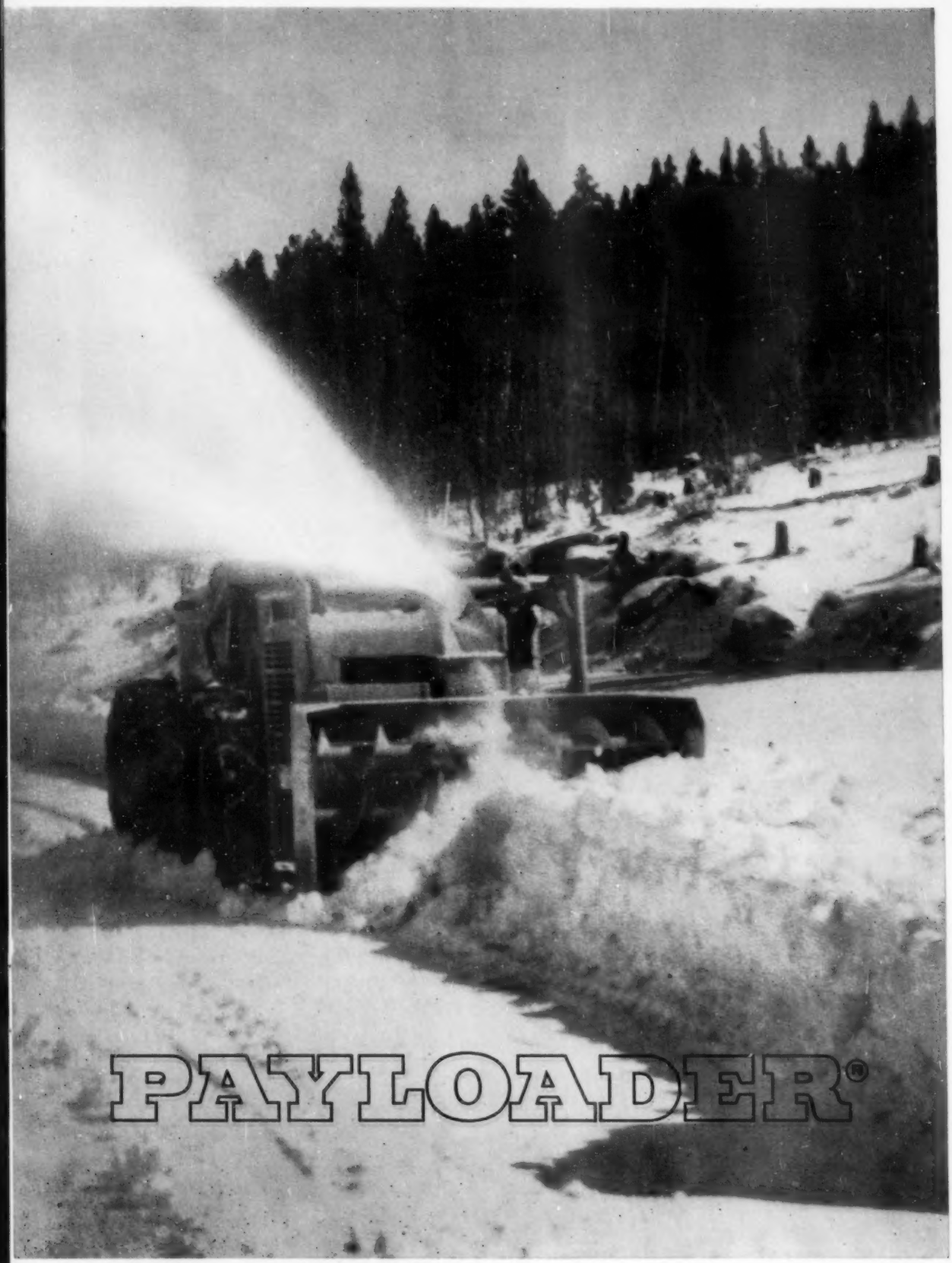
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Progressive communities* are including bituminized fibre pipe in their codes . . . BERMICO is lightweight, rootproof, easy-to-install . . . lasting protection for sewer lines or house-to-septic tank connections . . . exceeds Federal Specification SS-P-356 . . .

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THE *Versatile* JOHN DEERE "440"

Today, It's a Mower... Tomorrow, a Loader

Big projects or odd jobs, the John Deere "440" takes them all in stride! With ample power, maneuverability, and handling ease needed for grading and loading, the "440" also provides fuel economy that shows up in real savings on mowing and other routine jobs. This tractor-of-all-trades pays off in even greater versatility when you take advantage of John Deere attachments that further cut costs. The 5/8-yard loader bucket, for example, can be quickly replaced by a multi-use blade, fork lift, or crane, for example, to adapt this low-cost tractor power to other duties in park maintenance.

GASOLINE OR DIESEL

The John Deere "440" Tractor is now available with either gasoline or Diesel engine power. Two other utility tractors are also offered with a wide variety of power-matched equipment. And any John Deere Tractor can be purchased on terms through the John Deere Credit Plan. See your John Deere Industrial dealer for detailed information.

JOHN DEERE Industrial Tractors and Equipment

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GROUND PRESSURES EXCEEDING TRUCK LOAD LIMITS

FAST
MODEL SP900
GROUND PRESSURES:
500 LBS. PER LINEAL INCH
85 LBS. PER SQUARE INCH

The TAMPO SP900 yields the highest unit ground pressure attainable with any roller to densify surfaces beyond traffic stress, resulting in a stable roadway. Maximum surface pressures are applied without damage to underlaying courses or overloading of highway structures.

20th ANNIVERSARY

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SAN ANTONIO 7, TEXAS

LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

F.O.B. Point of Shipment

Gale v. City of Saint Paul, 96 N.W. 2d 377, decided by the Supreme Court of Minnesota on March 20, 1959, was a taxpayer's action against the city and against a contractor to have the contract awarded by the city to the contractor declared illegal and to enjoin them from performing the contract.

The city received competitive bids for the purchase of 8000 tons of unburned lime for the Municipal Water Department. The formal quotation forms furnished by the city contained the clause "Delivery to be F.O.B. point of shipment".

Three bids were submitted on this form. One was disqualified for failure to submit a check or bond as required. Linwood bid $11.10 per ton, or a total of $88,800. At the bottom of the form was typed "Freight Rate Per Net Ton—$7.20" (thus making a total cost to the city of $146,400).

Cutler-Magner Co. submitted a bid of $14.50 per ton or a total of $116,000, and typed on the form "F.O.B.—Duluth, Minnesota or Superior, Wisconsin". A separate letter accompanied the bid stating that the freight would be $4.00 per ton from either place (thus making a total of $148,000). Two days after the bids were opened, Cutler-Magner notified the city that its previous statement of the freight rates had been in error and that the rate from Duluth was $3.80 per ton (thus making a total of $146,400, the same as Linwood). The city stated, however, that it could not make the change requested, treating the freight price quoted in the first letter as part of the bid.

The other bidder, who was disqualified as indicated above, had bid $23.60 per ton or a total of $188,800. It had struck out the words "Delivery to be F.O.B. point of shipment" on the formal quotation, but inserted "Delivered Cost Price Filtration Plant St. Paul, Minn."

Thus, there were three different interpretations of the specifications on the part of those submitting the bids.

The contract was awarded to Linwood.

The court held that the formal quotation forms were ambiguous and uncertain as to whether the point of delivery was St. Paul or the point of shipment, and that this ambiguity was sufficient to constitute a violation of the requirements of competitive bidding even though there was no suggestion of favoritism or wrongdoing in the present case. The court said, "It is the potential of wrongdoing afforded by the ambiguity which is objectionable and which could stifle competition through favoritism. In view of the policy and purpose of competitive bidding to promote honesty, economy, and aboveboard dealing in the letting of public contracts, there must be rigid adherence to the requirements to accomplish this purpose and a violation of the requirements compels a decision which nullifies the contract awarded."

Blocking the Street

City of Jamestown v. Miemietz, 95 N. W. 2d 897, a North Dakota case decided April 6, 1959, was an action by the city against landowners to abate a public nuisance, and to compel them to remove their dwelling from a public street in the city. The landowners relied on a claim of adverse possession, and counterclaimed for negligence. The trial court entered a judgment in favor of the city, and the landowners appealed.

It was undisputed that 14th Avenue Southeast had been dedicated as a public street by the filing of a plat in 1881.

Help control Water Department costs—

1. By accurate registration of all water sold.
2. Meter all services—homes, factories, public buildings.
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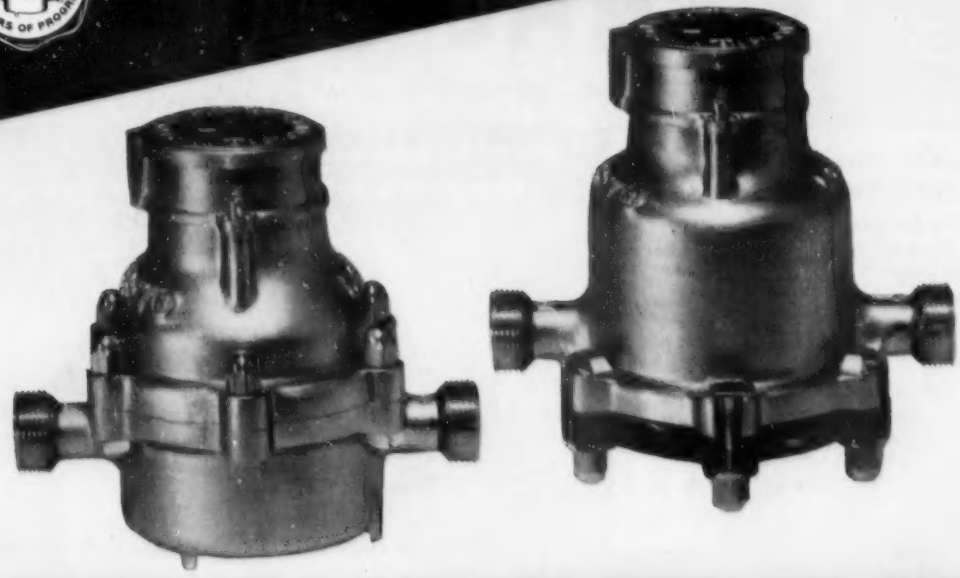
HERSEY 1859 1959 100 YEARS OF PROGRESS



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DEDHAM, MASS.

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The defendants argued that by virtue of a map attached to their abstract of title, they entered into possession in 1938 under a claim of title founded upon a written instrument, and that they and their predecessors had occupied the premises more than 20 years prior to the commencement of this action, and that they have held adversely to the city during this period.

It was held, however, that a municipality cannot be divested of the title of its streets by adverse possession for the prescriptive period. While public ways can be *established* by prescription, they cannot be destroyed in this way. What is required is intention of the public to *abandon* the street.

Defendants further contended that the city was equitably estopped from maintaining its action on the ground that verbal authorization was given by the city engineer to build an addition onto the dwelling of the appellants without moving the original dwelling from its location. The city engineer denied that he was upon the premises as claimed by the appellants or that there had been any discussion with him relative to location except the map drawn on the application for a building permit.

It was agreed, however, that there was no survey made by the city engineer at that time, and there was no obligation imposed by tatute or ordinance to require such a survey to be furnished by the city in connection with the making of application for a building permit.

They had some doubts as to the location of their dwelling, and questioned whether or not it was "far enough back." According to the defendant's testimony, they received no affirmative reply from the city engineer, and they nevertheless went ahead with the proposed construction.

The court held that there was no estoppel. "(They) were not induced to make the expenditure of their improvements by any acts of the city or its officers."

The defendants were thus ordered to remove the building.

Stuffed Sewer

Collins v. City of Greenville, 105 S.E. 2d 704, decided by the Supreme Court of South Carolina Nov. 5, 1958, was an action against the city to recover damages resulting from sewage overflow caused by the city's attempt to remove rags and waste material causing an obstruction. In so doing, the city caused the sewage to back up and overflow the commodes in two buildings owned by the plaintiff, ruining the hardwood floors and carpets.

The court held that this was not a "taking of private property for public use without compensation", and also that the damage did not result from a defect in the street (which would result in statutory liability for negligence). The plaintiff did not sustain any injury while using the street as a traveler on it; therefore, the statutory liability is inapplicable, and the city's governmental immunity protects it from liability.

Municipal Arts and Crafts Center

Eversole v. City of Columbus, 154 N.E. 2d 442, decided by the Court of Appeals of Ohio Feb. 11, 1958, was an action by a student at a municipal arts and crafts center, against the city, for injuries sustained in a fall on an unlighted stairway.

The court held that the city was immune from liability for negligence, since this was a governmental activity and did not constitute a nuisance.

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1 **PRE-FABRICATED,** filaments bound in steel for mounting in the RYNAL broom core.

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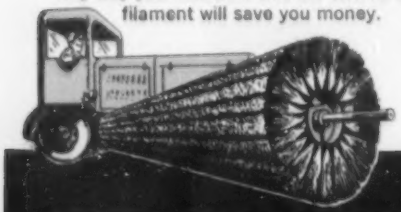
Any way you look at it this SR WHITE broom filament will save you money.



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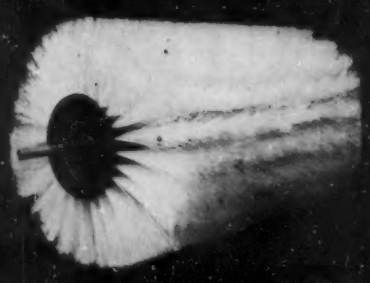

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GIVE US THE MAKE AND MODEL OF YOUR SWEEPERS AND LET US TELL YOU MORE ABOUT IT

Couples in seconds...
stays water-tight
TYLOX Gaskets form water-tight, compression seals automatically as pipe is coupled. They keep their elasticity, and stay water-tight for the life of the pipe itself.

TYLOX Rubber PIPE GASKETS

It takes only a few seconds to couple Tylox-Gasketed sewer pipe, but even more important than that, finished joints *stay* tight, preventing leakage in or out, and making future maintenance unnecessary by eliminating root and sediment problems. The installation above was a joint project of the Virginia Polytechnic Institute and the Town of Blacksburg, Virginia, R. Stuart Royer & Associates, Consultants, Richmond, Va. Pipe work was by Gimbert and Gimbert Construction Co., Roanoke, Va., and 15" Tylox-Gasketed Pipe was furnished by Roanoke Concrete Products Co., Inc., also of Roanoke.

Pipe joints formed with Tylox rubber Gaskets stay tight because they keep their original elasticity. Under ground and under compression, sewerage and industrial waste acids won't deteriorate the specially compounded Tylox rubber, and pipe angularities from shifting soils or overburdens can't break their seal. Leakage, with resultant evils of root and sediment penetration is whipped because it *can't start!* Waste disposal designers and builders know this . . . and it is why there are more TYLOX Gaskets in low head service than all other types of gaskets combined. As for speed of assembly, there's no joint that can be coupled any faster than TYLOX.

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if you are not thoroughly familiar with its time-saving, cost-saving engineering advantages. Tylox Joints are the one sure way to get water-tight pipe lines at less pipe-laying cost.

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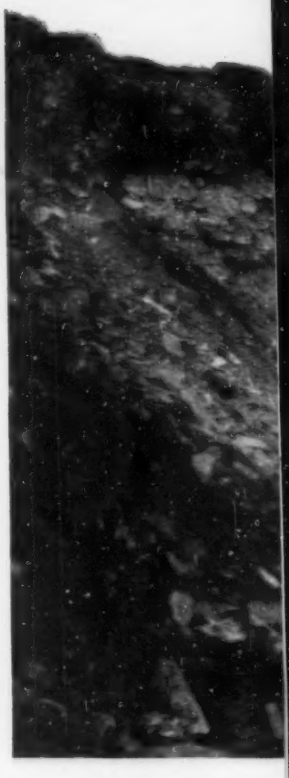
5134

Shattering shale-like material for fast easy loading—with the Drott scarifier attachment for the TD-15 4-in-1. This outfit tends the sanitary fill operated by East Pennsboro Township, Enola, Pa. "This operation calls for a dozer, ripper, clamshell, and loader, and the 4-in-1 with scarifier does the whole job," states Operator Ted Klischer.



With clam lip lifted (hydraulically) this TD-9 4-in-1 becomes an earth-rolling, radius-controlled bulldozer! Owned by Noble County, Oklahoma, the unit is used to build haul roads for rock quarry trucks; remove overburden from deposits of road-surfacing stone; shatter the stone with scarifier; load stone on trucks to surface county roads!

How clam-action 4-in-1 gives

Applying uniform cover on refuse, this TD-9 4-in-1 illustrates exclusive clam action, vital to successful and economical sanitary landfill operation. Unit, owned by Borough of Hanover, Pa., operates a sanitary landfill serving 26,000 people.

Use easily-controlled clam action to fill the 4-in-1 with elusive loose materials (like this crushed stone)—in one fast gulp. And use this quick, stand-and-fill clamshell action for speedy, close-quarters loading!

Working for the Town of Charlottle, N. Y., this TD-9 4-in-1 is clearing brush and trees from right-of-way—helping widen a road for two-lane traffic. See how the 4-in-1 "clams" on to an uprooted sapling, for easy loading and removal!

Exclusive 4-in-1 "concrete-bucking" pry-over-shoe break-out action—breaks up, digs up, and loads out old pavement—gives shovel-like excavating power for many other tough jobs. The new TD-15 4-in-1 exerts 39,200 pounds of break-out force!

"Back-dragging" borrow material down by the truck-load, this new 2¼ cu. yd. TD-15 4-in-1 shows a popular (and exclusive) method of producing refuse "cover" for the sanitary landfill—or street-surfacing materials, wholesale. This same action can be used to clean or reshape ditch banks.

your city a BIG-CAPACITY "one-man equipment fleet"

with instant changeovers; versatility unlimited... all for one moderate investment!

Simply move the selector lever from the operator's seat—stopped, or on-the-go—and get your choice of machine actions to do an unlimited variety of cost-cutting operations! City and county officials everywhere are proving the exclusive 4-in-1 deserves to be called the "40-in-1," because of the endless types of specialized outfits it can replace!

Your clam-action 4-in-1 can demolish and load-out unwanted pavement, curbings, or sidewalks—clear land and rough out new streets—install culverts with "mass-production" speed—build reservoirs, level land and landscape. It can give amazingly low costs, producing and loading street surfacing materials from pit or bank, and can spread them accurately.

This one-man-operated "equipment fleet" can give you power-shovel-like digging force for tough excavating, or can grade or strip with inch-close accuracy. And able to "double" for four big-capacity machines, at a fingertip nudge, the exclusive clam-action 4-in-1 handles the whole shebang of sanitary landfill jobs—with the efficiency and economy to leave old-style single-action loaders with their buckets dragging!

See what one moderate investment can buy your city in multiplied usefulness—in big-capacity versatility unlimited—in an International Drott 4-in-1. Prove what it means to have instantly available in one heavy-duty machine, under one operator's control, the full-sized performance of bulldozer, "carry-type scraper," Skid-Shovel, and clamshell. Compare the performance and long life protection of exclusive shock-swallowing Hydro-Spring. See your International Drott Distributor for a 4-in-1 demonstration!

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WASTE DISPOSAL HAS COST RECOVERY POSSIBILITIES

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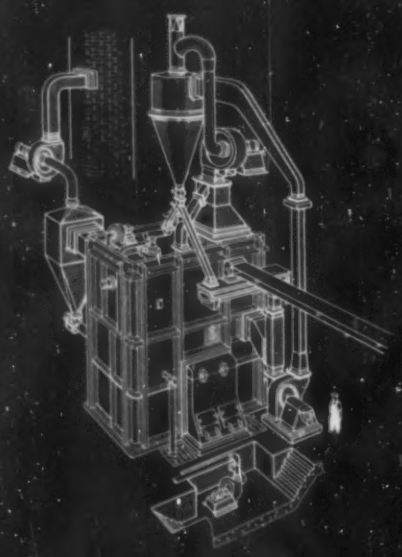

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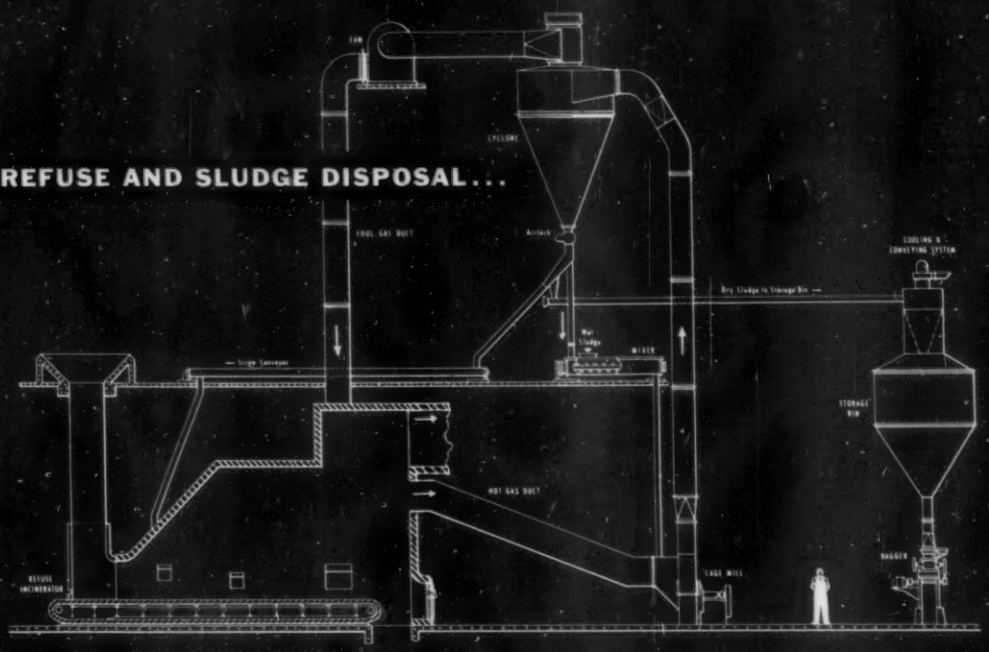
THE C-E RAYMOND FLASH DRYING AND INCINERATION SYSTEM

is the **only** system that permits both drying and incineration of sewage sludge – separately or together – in any proportion. This service-proved equipment today processes more filter cake than all other systems combined. High temperature deodorization and efficient fly ash collecting equipment assure that nearby residents are not bothered by air pollution. The C-E Raymond System's unique design and **control** also assure economy of operation and uniformity of product.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

FOR REFUSE AND SLUDGE DISPOSAL...



THE C-E INCINERATOR STOKER AND THE C-E RAYMOND SYSTEM

combine a half-century of experience in burning all kinds of conventional, marginal and waste fuels with the most service-proved drying system. Using "continuous" processing, the C-E Incinerator Stoker requires only minimum operating attention and maintenance. From the time refuse is fed into the self-sealing, non-clogging hopper, until the incinerated residue is discharged to the ash pit to be hauled away, the entire operation is automatic, efficient, quick and clean. The C-E Incinerator Stoker is capable of burning all types of combustible refuse in quantities ranging upward from 50 tons per 24-hour day. Heat from the burning refuse is used by the C-E Raymond Flash Dryer System to dry sewage sludge.

Yes, even waste disposal can be turned into a *productive* function. Municipalities all over the country find new economies . . . new revenues . . . through their use of Combustion units like those shown on these pages. With continuous, near-automatic processing, substantial manpower can be diverted to other duties . . . capacity per dollar of investment is increased . . . usable and marketable end-products are produced.

Many communities turn sewage sludge into a desirable, humus-rich soil conditioner with the C-E Raymond Flash Drying and Incineration System. Often, they can recover a large part of their operating expenses from sale of this conditioner or use it to maintain parks and recreation areas. Other towns use units of the same design to incinerate sludge to sterile ash. These versatile units can produce one or both end-products in any proportion.

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To make the most of existing property, economy-minded municipalities are looking more and more into the possibility of *treating both refuse and sewage sludge* at the same plant site. Aside from the obvious benefit of lower capital investment, there's the added benefit of being able to combine both manpower and equipment, eliminating costly duplication. In addition, the C-E Refuse Incinerator can readily supply *no-cost heat* to dry sewage sludge.

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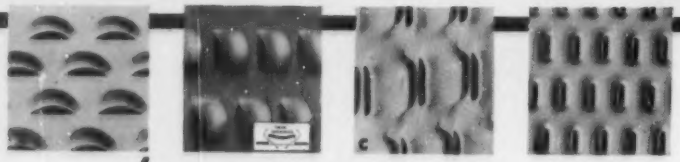

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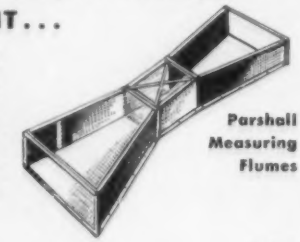

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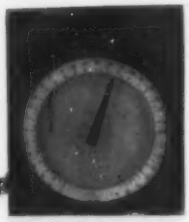

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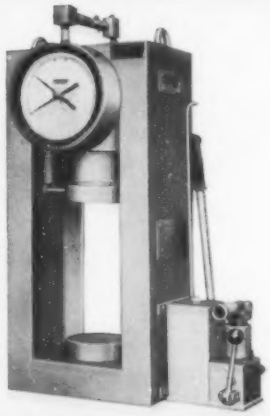

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HAZARDS FROM AERATION BASINS

I saw the article by LeRoy Van Kleeck on safety in the June Issue of PUBLIC WORKS and am glad to see material of this kind published. In this connection, I wonder how far you have gone into the matter of the very real hazards associated with aeration basins at activated sludge plants. These basins are filled with air and water; therefore, the bulk density and buoyancy should be less than for water alone. Furthermore the basin may be partially or completely covered with foam. Also, there will be considerable turbulence. In view of these factors, I wonder if even a strong swimmer would stand much chance. However, within the last few years I read in some magazine about British experiments where a volunteer actually was able to swim in an aerated basin. I can't recall the details and wonder if you are familiar with the British investigation. Whatever the results of their study, I think such basins should have guard rails. I note the picture on Page 100 of the June issue of PUBLIC WORKS shows a large aeration tank without any protection. Doubtlessly there are dozens of other tanks of similar design not equipped with guard rails.

It seems to me that the hazards of deep basins, particularly aeration basins, should be emphasized. I think LeRoy Van Kleeck could write a good article on this subject and hope he will do so.

Paul D. Haney,
Black & Veatch,
Consulting Engineers,
Kansas City, Mo.

Editor's Note: The tank shown on page 100 of our June issue is protected by guard rails. The picture was so cropped for use that only a part of the fencing is shown; but the original photograph shows the entire unit surrounded by a fence. Reference is made to Federation Manual No. 36 for further details in regard to safety practices.

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To further increase the efficiency of your work, each of these loaders has a whole family of buckets. You choose the size that is most suitable for your operating conditions and the materials you handle. Buckets range from 2¼ to 5 yd for the TL-20; 1½ to 4 yd for the TL-16; 1 to 3 yd for the TL-14.

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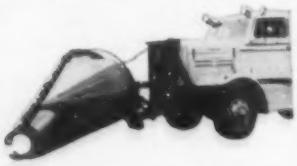

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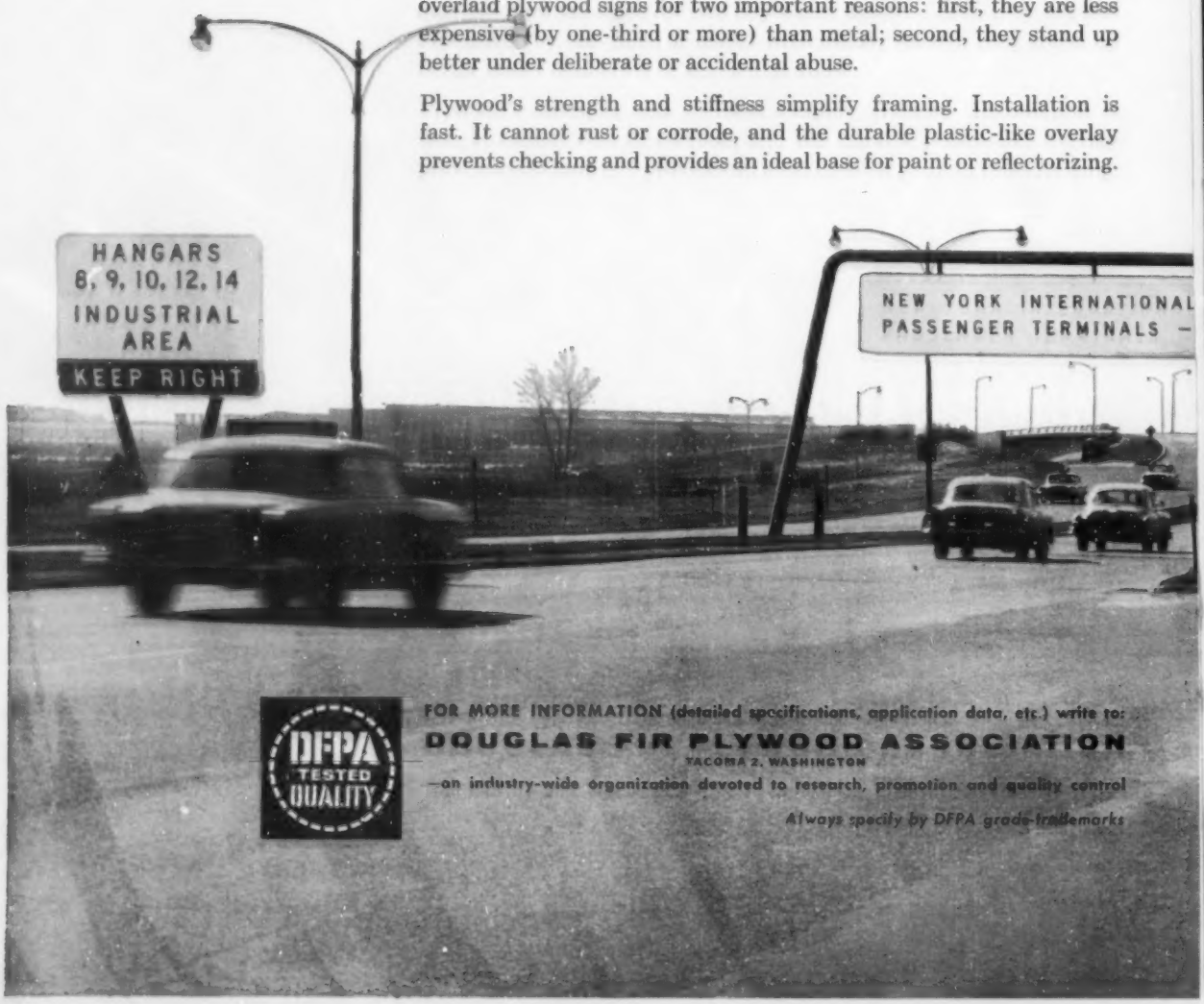

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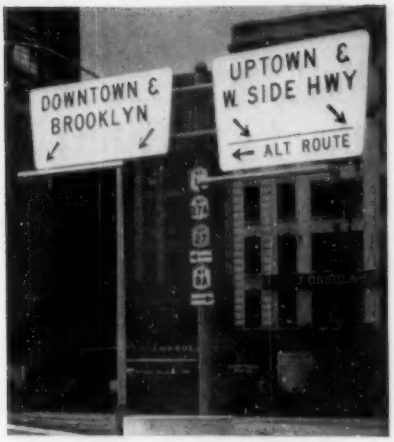

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—Vice President H. A. Uren, Bacco Constr. Co., Iron Mountain, Mich.

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Another big reason Mr. Uren—and his operator, Guido Jafolla—like the No. 12 is the optional Preco Automatic Blade Control. With this amazing device, the operator simply selects the desired slope on a large, easy-to-read dial. The Automatic Blade Control guarantees him blade accuracy to within ⅛ inch in 10 feet. "We don't even need a subgrade planer," says Operator Jafolla. "And we're miles ahead of the paving train."

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PUBLIC WORKS *Magazine*
Vol. 90, No. 8 • August, 1959

103 Miles of Trunk Sewers

for COUNTY SANITATION DISTRICTS

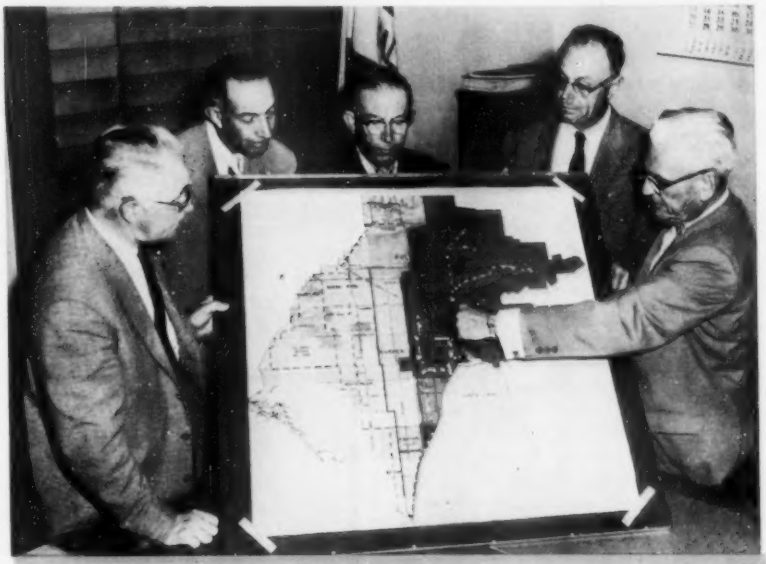
LEE M. NELSON,
General Manager,
Orange County Sanitation Districts,
Santa Ana, California

ONE of the largest sewer projects ever undertaken in this country was started in Orange County, California, this past year. In July and August voters in three of eleven Sanitation Districts located in the county went to the polls and approved bond issues totaling $23,180,000. The fact that passage of the bond issues meant increased tax rates from 9 cents to 20 cents per $100 assessed property valuation had no effect in deterring the voters. In Sanitation District 11, for instance, where a two-thirds majority was needed the issue passed by a vote of 567 to 147.

Voter acceptance of these bond issues was not just a natural occurrence though. Through the efforts of our Orange County Sanitation Districts staff, an effective public information campaign was launched to make residents acutely aware of the serious need for expanded sewer facilities.

The people were informed that many trunk sewers in the area were flowing from 93 percent to 100 percent full during peak hours; and on a few occasions they had been so overtaxed that sewage backed up into the streets. This, plus the fact that new residents are moving into Orange County at the rate of 200 each day, necessitating 50 new homes daily or over 18,000 homes a year, made the residents realize that they had no real choice in the matter. Disneyland, located in the population center of Orange County, attracts additional millions of visitors to the area. New sewers were needed, and immediately.

The development of any area, in my opinion, is dependent on four basic facilities: 1) water supply; 2) transportation and communications; 3) power—electric and gas; 4) waste disposal — domestic and industrial. Orange County was in adequate supply of the first three, but not the fourth. It's my personal feeling that sewers become important only when absent. They're like the fourth wheel on an automobile.



● **LOCATION** of trunk sewer lines needed by Orange County is pointed out to the County Supervisors and the County Health Officer by the author, at right.

District Organization

Perhaps one thing that made the project so successful was the unique organization of our Sanitation Districts. They were created because of a geographical need. Sewage disposal in southern California poses more of a problem than in most areas of the nation as there are no rivers with sufficient water the year around to carry off treated wastes. In Orange County some of our cities are many miles distant from the shorelines of the Pacific.

In 1921 the Orange County Joint Outfall Sewer (JOS) was organized by agreement between the cities of

● **GRAVEL** bed in trench bottom provides stable bed for the clay pipe. Over ½ mile was laid daily in District 11 to complete work before start of the rainy season.

● **EACH YEAR, in housing developments and growing cities, 18,000 new homes are being built in Orange County. New trunk sewers became a critical need and County sewage treatment plants were expanded. Plant No. 1 now has a capacity of 55 mgd.**

Anaheim and Santa Ana for the purpose of sharing jointly construction costs and the operation of a screening plant and ocean outfall. Between 1921 and 1927, the cities of Fullerton and Orange and the sanitary districts of La Habra, Placentia, Garden Grove and Buena Park became participants in this joint agreement.

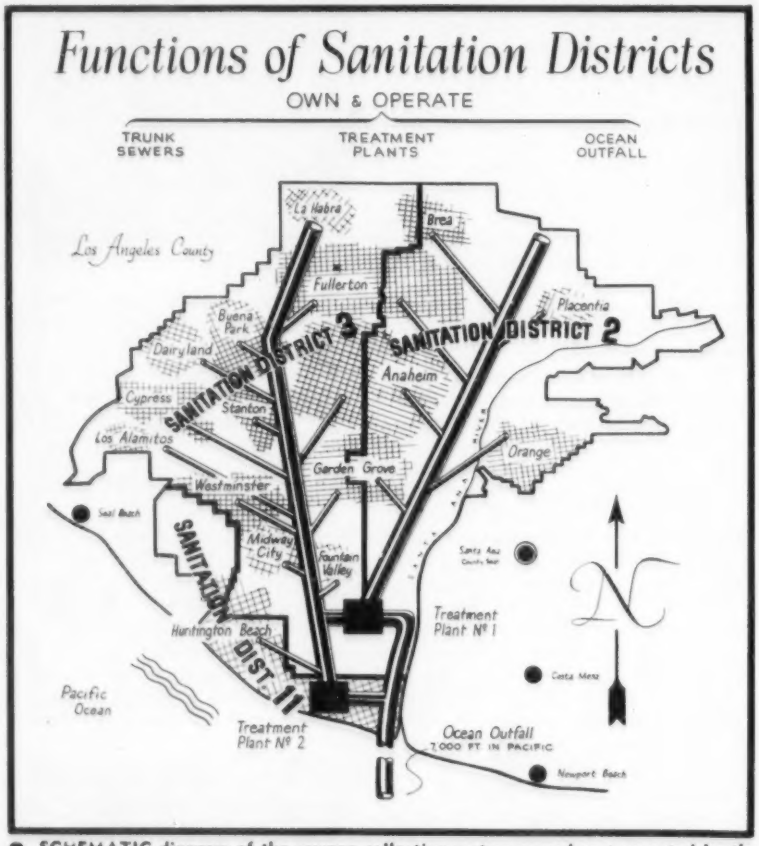
Through these participating agencies, the JOS constructed a treatment plant, several trunk sewers and an outfall to the Pacific Ocean, now known as the old ocean outfall. Thus, eight of the northern and central cities and sanitary districts were served by a jointly owned sewerage system at a cost within the economic capability of each.

There were many problems in administering this joint venture at city levels due to limitations of city authority outside of corporate limits. Community organizations and civic groups were conscious of county-wide development over a period of 20 years and of the growing need for a program to service rapidly expanding areas. The factors of administration, expansion and development called for further action.

In 1946 the Orange County Board of Supervisors authorized a board of consulting engineers to prepare a sewerage survey report. After considerable study this report was modified and became the basis for the formation of the eight sanitation districts. Organizational phases of the sanitation districts were under jurisdiction of the Board of Supervisors. After formation, each district became an independent political subdivision with its own governing board which operates under the district act of the health and safety code of the state.

The function of collecting and transporting sewage from local areas to the sanitation districts' facilities is performed by cities, sanitary districts and other special districts. Through inter-district contracts, means of administration, construction and operation of facilities for the eight districts were established.

The joint administrative agreement and the joint construction and operation agreement are the two basic contracts governing the combined business of the districts. Provisions are made to permit other agencies or combinations of agencies to participate in the Joint Administrative Organization. Under these



● **SCHEMATIC diagram of the sewage collection system owned and operated by the Orange County Sanitation Districts. Trunk sewers are 15-inch to 78-inch diameter.**

contracts the Joint Administrative Organization, with one central office, administers the business and operating expense in direct ratio that its usage of facilities bears to the cost, and all districts share the joint administrative expense.

Under California law, county sanitation districts have broad powers to provide collection, treatment and disposal of all types of waste. However, all of the sanitation districts in Orange County limit their activities to area-wide collection, treatment and disposal of sewage and liquid industrial wastes. They do not handle garbage, refuse and other solid wastes; neither do they own or operate local sewage collection systems. Their function is the ownership and operation of major trunk sewers (from 15-in. to 78-in. diameters), two sewage treatment plants and a 78-in. diameter disposal outfall 7,000 feet into the Pacific Ocean. The original collection of sewage at the local level is handled by individual cities and sewering districts within the Sanitation Districts.

Sanitation Districts

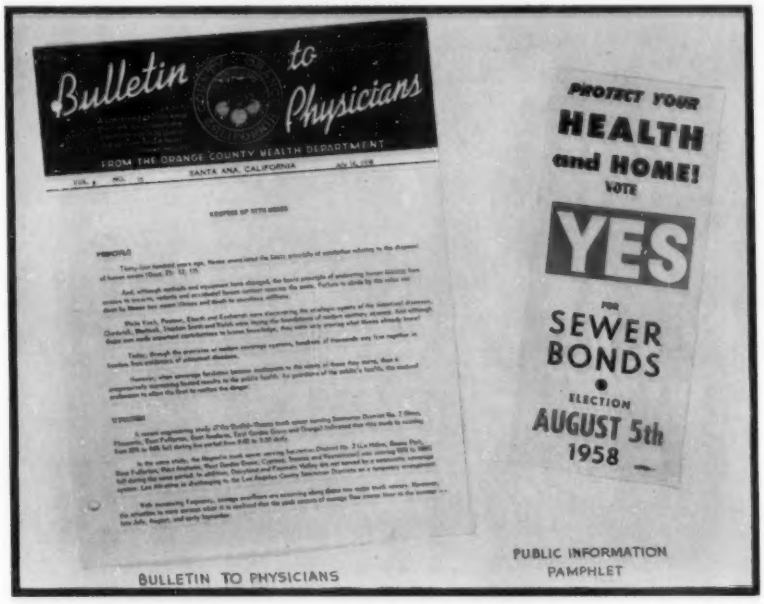
The accompanying chart shows schematically the system owned and operated by the Sanitation Districts in Orange County and also shows the cities and local agencies from which sewage and industrial wastes are collected in Districts 2, 3 and 11.

Late in 1957, the Directors of our Orange County Sanitation Districts retained independent engineering firms to proceed with plans to provide the necessary sewage disposal facilities. Lowry-Overmyer and Associates of Santa Ana were assigned the work in District 11 and the same firm working jointly with Boyle Engineering, also of Santa Ana, prepared surveys for Districts 2 and 3.)

Promoting Bond Issues

Early in 1958 the Orange County Sanitation Districts started their promotion campaign to acquire the needed increase in collection facilities. Individual promotion programs were started in Districts 2, 3 and 11. In District 2 a bond issue of $8,650,000 was proposed; in District 3, $13,015,000; and in District 11, $1,515,000. The overwhelming voter approval in all three Districts gave us the confidence we needed and we immediately set to work. Actual construction started in September, 1958, and will be completed, with the system in operation, by December, 1959.

Extra strength, vitrified clay pipe was selected as the most suitable pipe for the job. Some 70 miles of clay pipe, ranging from 12 inches to 42 inches in diameter, will be used in lengths up to 5 feet. The proposed trunk sewers are designed to serve and have a useful life of at least 50 years. In areas within the three districts where pipe over 42 inches in diameter is required, the larger pipe will be protected by suitable liners.



● **SPECIAL bulletins and public information pamphlets formed part of the effective promotional campaign that brought an overwhelming approval of the bond issue.**

Many of the gravity sewers in the area are located below sea level and are subject to tidal actions. Hence, rapid pipe laying is economically necessary. George Dakovich, Los Angeles contractor installing pipe in District 11, has been laying over a half mile of pipe a day all with hot pour joints. Over 103 miles of pipe in all 3 districts will be in the ground and operating as an integral part of our Orange County sanitation system by December of this year. To the best of my knowledge, this makes it one of the largest single sewer projects ever undertaken in this country and scheduled for completion in so short a time.

After treatment, all sewage from the collection system passes into an ocean outfall line and is pumped into the ocean some 3 miles from shore. Since this part of southern California is noted for its vacation areas and beaches we have to insure that there is no danger of contaminating the coastal waters beyond safe limits. To detect possible pollution, readings and water samples are taken twice a day, every 3,000 feet, along the coastal section in the vicinity of the outfall.

A great deal of credit for the successful planning and execution of this undertaking must go to Willis Warner, who has been Chairman of the Orange County Board of Supervisors for over 20 years. The mayors and city officials of the cities within the districts were also highly instrumental in informing the citizenry, as were the various Citizens Committees composed of businessmen, educators, the clergy and others. Everyone pitched in to see that the voters were apprised of the facts. The voters did the rest.

We now have a sanitary collection system that will be adequate to the year 2000. The excellence of its design will make subsequent additions a simple matter.

I'd personally like to urge officials of other sanitation districts throughout the country to take special note of what has been done here. Public works projects do not necessarily take years to get under way; if the need really exists, and you take advantage of every means available to inform the taxpayers, it can be accomplished quickly and efficiently. Perhaps even more important is the fact that if the people are fully informed, they will not begin to wonder where their money went as soon as the trenches are covered. As public officials we can't afford to forget that a satisfied citizenry holds the key to the door of future civic improvements.

FILTER HYDRAULICS AFFECT CLEAR WELL DESIGN

FRANK G. HONEYCUTT, Jr.,
Forrest and Cotton, Inc.,
Consulting Engineers,
Dallas, Texas

CITIES are finding that, as per capita water consumption continues to increase, their filtration plants must be operated at maximum capacity for longer periods during the summer months. Accordingly, operation at maximum capacity is of major importance in the design of plants.

Investigations of water demands for cities show that consumption, expressed as a percentage of the yearly average daily demand, will vary approximately as follows: Minimum demand, 65 percent; average daily demand, 100; maximum monthly demand, 155; maximum daily demand, 192; and maximum hourly demand, 350.

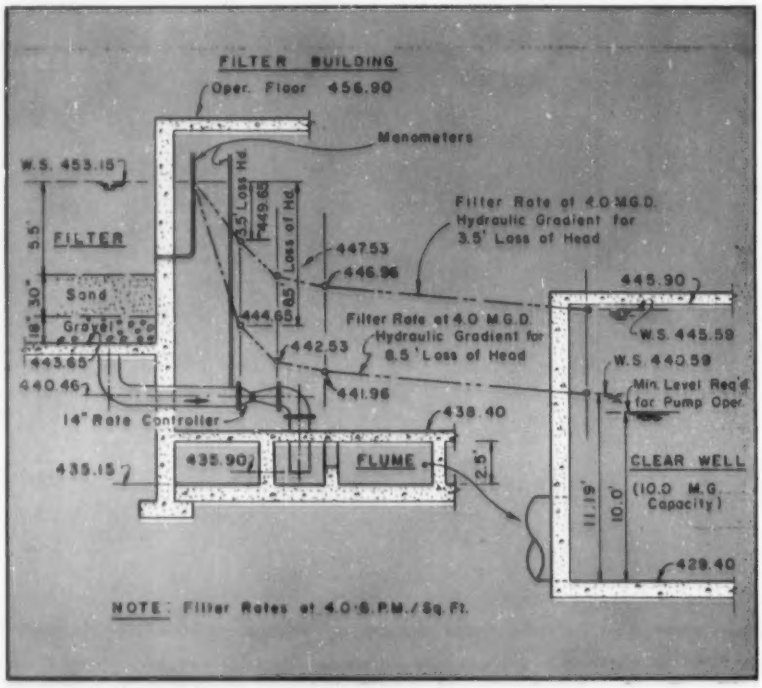
Best filtration operation is obtained at uniform daily rates. Variations in hourly and peak hourly consumption must be satisfied from ground and elevated storage within the distribution system. Clear wells are needed to iron out the filtering and pumping operations, for reserve supply in the event of a plant breakdown, and to supplement ground storage demands of the distribution system.

Too often the maximum water level in the clear well has been arbitrarily established by rule of thumb 8 to 10 feet below the water level in the filters. This practice may have sufficed in the past when maximum filtration occurred for very short periods. If the filters are to operate satisfactorily and the clear well capacity is to be fully utilized during periods of maximum plant output, a thorough investigation of head loss from the filters must be made.

The proposed City of Dallas East Side Water Treatment Plant will have an initial maximum capacity of 100 mgd with provisions to expand in logical stages to an ultimate 500 mgd maximum capacity at a filter rate of 4 gpm per sq. ft. Hydraulic conditions at the existing City of Dallas Bachman and Elm Fork Water Treatment Plants were analyzed to establish certain design criteria for the proposed East Side Water Treatment Plant.

At the Dallas Bachman plant, during summer periods of 100 mgd maximum output at a 4.0 gpm per sq. ft. filter rate, the set rate through the filter rate-of-flow controllers cannot be maintained beyond approximately 3.5 feet loss of head when the clear well is at maximum level or full. For example, if a clean filter is set for a flow of 4.0 mgd through the controller, upon approaching a head loss of 3.5 feet, the filtration rate will begin to decline although the controller is wide open, and continue to decline as the sand bed becomes dirtier. This results in exceedingly short filter runs and requires excessive backwashing in order to maintain the maximum rate of filtration.

Investigations were made to determine the required level of the clear well to allow filtration at maximum rates up to 8.5 feet loss of head. Computations of head loss at maximum rate with a full clear well verified that at 3.5 feet loss of head the rate of flow through the filter would begin to decline because of the limited head available.



● **FIG. 1. Hydraulic design, Bachman Plant, filters at 100 mgd plant capacity.**

Also, to be able to run the filters up to 8.5 feet head loss, generally accepted in waterworks practice, and get longer filter runs the clear well level must be drawn down from 16.0 feet to approximately 11.0 feet in depth to give the available head required.

Field measurement of head loss was made with manometers. The results were reasonably close to those computed. Subsequent operation of the plant filters at maximum capacity with clear well depths 11.0 feet and less permitted filter loss

of head to be increased to a maximum of 8.0 feet.

To compound the problem at the Bachman plant, during maximum filtration, adverse pumping conditions impose another limiting factor on the clear well reserve supply when a reserve is needed most. The water depth in the clear well must not fall below approximately 10.0 feet in order to prevent the pumps from breaking suction and maintaining maximum pumpage.

Thus, between the levels required in the clear well for maximum filtration and that for maximum pumpage operation, the reserve supply in the clear well, for all practical purposes, is reduced to zero. Such conditions are not conducive to best plant operation. In effect, plant filtering and pumping operations at maximum load must be closely synchronized. This defeats the original purposes of the clear well storage and provides no safeguard against breakdown during periods of maximum demand when the entire treatment plant and water distribution system is being taxed to capacity and the waterworks can least afford a shut down.

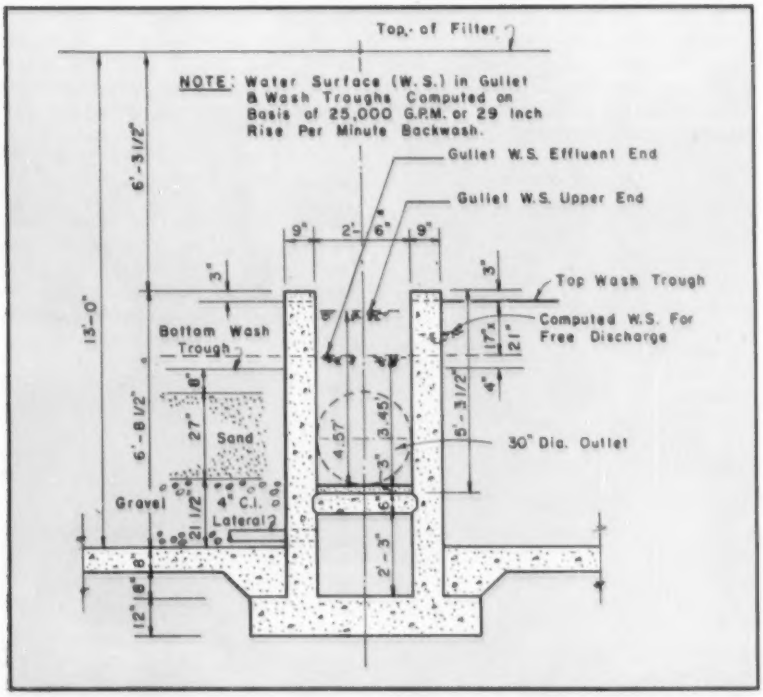
At the Bachman plant, the required available head on the filters measured above the clear well level is better than 13.0 feet. In other plants it may be even greater depending on the hydraulic losses from the filters to the clear well.

The problem of clear well depth and related pump setting must be investigated thoroughly if full use of the clear well capacity is to be realized. Pumping at high head and capacity is creating more and more problems of critical suction and discharge conditions which must be considered in the design of clear wells and pump station. Pump suction head loss is usually higher than expected. For example, recent investigations for the Dallas 176-mgd Lake June Pump Station, which will operate in conjunction with the proposed East Side Treatment Plant, shows that pump suction head loss due to friction and bends in the pipe type manifold considered, amounted to approximately 3.5 feet even though the maximum velocity in the manifold was held to 5.0 feet. Considering the required submergence and static suction lift, critical suction conditions are approached rapidly.

Naturally, when the overall head loss through a filter plant is considered from the mixing and clarifier basins on through the filters and clear wells to the pumps, the required head for full utilization of clear well capacity by gravity flow becomes of great import. Assuming 3.0 feet loss through mixing and primary clarifier basins, and say 13.0 feet available head on the filters, this fixes the maximum clear well level at about 16.0 feet below the head end of the plant. Now assuming a normal clear well depth of 16.0 feet, the overall head loss becomes 32 feet.

The designer is confronted with the problem of what to do to overcome the required available head economically without getting the clear wells and high service pump station too deep in the ground. The topography of the plant site will dictate the approach to be taken. First and perhaps the most economical solution is to have a site where the natural topography falls about 20 feet uniformly from the upper end to the lower end.

It is not always possible to acquire a site with such favorable topography. Then in such cases, where the natural topography is too flat, it becomes necessary to build the head end of the plant well above ground and the lower end some distance below ground. The design and layout may have to incorporate transfer pumps at the end of the filters to elevate the treated water to above ground clear wells. Two good examples of plant layout on flat topography requiring such transfer pumps are the City of Fort Worth South Holly Water Plant and the City of Houston Purification Plant.



● **FIG. 2. Computed hydraulics during backwash, filter gullet of Elm Fork plant.**

Wash Troughs and Gullet

The Dallas Elm Fork Plant filter units, each rated 4.0 mgd at 2.0 gpm per sq. ft. and having a sand bed area of 1,390 sq. ft. were originally designed for a backwash rate of 25,000 gpm, which is equivalent to a 29-inch rise per minute. The filters are equipped with rectangular wash water troughs 1'-9" x 1'-5" and spaced on 7'-1½" centers; and the bottom of the troughs were originally placed 8 inches above the sand bed. Under actual operating conditions, sand displacement occurs below the troughs and at maximum design backwash rate (29-inch rise) the troughs flood and do not operate properly for best results in washing.

The computed hydraulic results of wash trough and gullet conditions verify that at 25,000 gpm (29-inch rise) backwash rate, the wash troughs and gullet will flood and not operate properly as intended in the original design. The gullet is not large enough to prevent backwater and flooding conditions over the wash troughs.

Further computations indicated that the optimum backwash rate is

(*Continued on page 216*)

Light Snowfalls and Ice CAUSE OUR WINTER PROBLEMS

NORTH H. NEWTON,
Champaign County Engineer,
Urbana, Ohio

SNOW and ice control is always an unpredictable and an unknown quantity. You are always trying to out guess nature. Sometimes you win and sometimes you lose.

Champaign County, Ohio, is a small rural county in the west central part of the state. It is about 12 miles north of Latitude 40 (north) and the winters are usually on the mild side.

The snowfall is light, coming in light quantities of 2 to 4 inches at a time. These light snows will usually produce some drifting on the country roads and therefore, it is nearly always necessary to send out the snowplows even though the snowfall may not be more than 2 inches.

It is not often that there are heavy snows that cause drifting. Occasionally there have been winters where the drifts have been 6 to 8 feet deep, but this has occurred only once during a winter.

Many county highway departments do not have adequate equipment to handle what would be classed as a heavy snow. However, the smaller departments are being equipped with some heavier equipment for emergency use. The economy of the country is becoming more dependent on motor transportation and it is more necessary to keep these wheels turning all the time. Therefore, it is necessary that highway departments have equipment adequate to meet any reasonable situation that may develop.

● **TRUCK operator uses radio to get instructions from the Superintendent. Note large step-type gasoline tank.**

Use of Radio

Radio is our best piece of equipment. It is impossible to say enough about the use of radio in highway department operations because all our operations are based on instantaneous communications through the use of two-way radio. We have 28 mobile radio units. The Road Superintendent can sit beside his radio microphone and a highway map and tell where every truck is along the road. The progress of the crews and highway conditions are available at all times.

● **LOADING salt into an 8-yd. FWD 6x6 truck with 955 Traxcavator. The two-tone paint job can be seen on the truck.**

Before radios were available a truck would break down or would slide into a ditch and it could be two or three hours before the crew could get word into the garage. Now with radio any difficulty is reported, and if repairs are needed, a repair crew is on its way in a few minutes. If another truck or snow plow is needed, a reserve truck can be sent immediately.

The use of radio makes all equipment more mobile and this allows near maximum use from equipment and work force. It makes the outfit more efficient.

Occasionally we will have a snow storm that affects one side of the county. When this situation becomes apparent, the snow plows can be shifted to areas where they are needed. Our trucks all carry large tanks of gasoline so they can be shifted without coming into the garage for extra fuel.

● **PLOWING back snow with a GMC truck with an automatic transmission. Either a one-way or V-plow can be used.**

We have not used any of the specialized weather forecasts that are available. There are some weather service or forecasting companies that will give detailed forecasts for a local area. We try to get the best general weather forecasts for our territory and use them.

Nearly all the county highway departments around us have a few

plows that are a little larger than are normally required. We have five V-plows for trucks and one V-plow for a grader. The V-plows are not often used; however, they are available if needed. The five trucks that mount V-plows usually mount one-way plows and their hitches will mount either type of plow.

We use comparatively small trucks for the smaller plows, but do have six trucks varying from 20,000 to 25,000 pounds, GVW, that are used to carry the heavier plows.

Two of the heavier trucks are FWDs with tandem rear axles and 8-cu. yd. dump bodies. One of the trucks has an aluminum dump body. These trucks are good whenever the going gets rough.

Two Ross V-plows are used on two FWD 6x6 trucks. Two Gledhill V-plows are used on a Mack and a GMC truck. The GMC has an automatic transmission. One V-plow is made by Good Roads and is used on a White truck. An Austin-Western grader, Model 99 Super, mounts a V-plow and this is our largest unit. We do not know what it can do because it has never really been tried out. It has been used a

● **PLOWING back the snow with a Chevrolet truck. Not shown in photo is a rear attached Swenson spreader.**

little, but never near its capacity. We think that it will handle any snow drift that we will ever get in this territory.

We have five lighter trucks that mount light one-way plows. Three Ford trucks mount Gledhill plows; two Chevrolet trucks mount Gledhill plows; and a Dodge truck mounts a Good Roads plow. All of the trucks use front hitch mounting.

Our highway system is divided into six snow plow routes. This gives each crew approximately 40 miles of road to plow, which means an 80-mile round trip. I don't think that all of our plows have ever been out at one time because some plows are always held in reserve.

Chemicals and Abrasives

We use straight chemicals and treated abrasives for ice control. We use the salt as a straight chemical and the treated abrasives are sand treated with calcium chloride. Under mild temperatures and a reasonable amount of traffic straight salt works very well. Under low temperatures treated abrasives give better results. On roads that have very light traffic we are of the opinion that treated abrasives give the best control under all temperatures. Our ice control is all done on country roads and the abrasives do not create any secondary problem such as filling up catch basins on city streets.

On ice control we generally treat the hills, curves, intersections and railroad crossings. The straight parts of the road are not treated.

● **ONE-WAY plowing with a Mack truck. The small lights on pipe frame are for use when plowing deeper snows.**

We do not feel that we have the finances to do a complete job. Generally our traffic does not warrant the full treatment.

Our ice control equipment consists of 14 spreaders of different types. Our newest spreaders are pull type ground driven spinners made by Gledhill. We have five of this type. The four Swenson tail gate spreaders are driven by a chain from a spider on a rear wheel. The four Jiffy spreaders are for salt only. These are auger type units that distribute salt at the left edge of the truck body. This allows a strip of salt to be placed on the center of the pavement. One Scotchman spreader is used principally as a salt spreader.

Our crews generally like the pull type spinner spreaders because they are the simplest to hook up and operate. They are the first ones out on the road and no one rides on these spreaders. A man does ride on the back of the truck, but he is in a safety cage and it is impossible for him to fall out of this cage. He is where he can see everything and can vary the rate of spread if it is necessary. The spreaders can handle most any kind of material.

We try to keep our equipment in good operating condition at all times. If something needs to be repaired, it is done as soon as the need for repair appears. By having good mechanics and truck drivers, pride is taken in seeing that the equipment is in good operating condition.

Our operating personnel are all experienced with not much turn-

● **REAR view of FWD truck with aluminum body used on salt spreading. Safety cage and spreader are made by Gledhill.**

over. When a new man is hired he will be assigned to work with an experienced man. Each snow plow or ice control truck is operated by a two-man crew and this makes it easy to train a new man.

Public Relations

I don't think any of the small counties do a very good job of public relations. Our public relations program is never what it should be. The local newspaper does ask about highway conditions and we give them as much data as we can. They in turn have always cooperated and done a good job in their reporting.

Public relations is a field that many engineers overlook. It is a field where much can be done to make the highway work easier and better understood by the general public. One of our projects in this field relates to our equipment. We try to keep all of our equipment well painted and in good appear-

ance. We use a two tone paint with the top part of the truck cab extending down to the bottom of the door glass or to some body line on the cab painted white. The remainder of the truck is painted orange. This makes the equipment readily visible at a distance. It is distinctive and cannot be confused with any other highway department.

We try to use the proper equipment for the job because hand labor is out of the question today. Conditions are changing fast and you cannot stand still. Machinery must be continually changed or you will have a lot of obsolete machinery on hand that will not do your work and be costing you money.

We operate in a very progressive rural area. The farmers are continually being forced to buy new machinery and they notice equipment used by other organizations. We have had much favorable comment on our equipment by these people who appreciate good and efficient equipment that will do a job better, quicker and cheaper.

Every operation that is possible to mechanize must be mechanized. This applies to all operations. Your budget will go farther.

TRAINING and ORGANIZATION *Prepare for* RAPID CHANGES OF WEATHER

JOHN F. WINTER,
Statistician,
Department of Public Works,
Portland, Oregon

PORTLAND, Oregon, with a population of 402,300 people is located near the confluence of the Willamette and Columbia rivers, between the coast range and the Cascade Mountains. It is approximately ninety miles inland from the Pacific Ocean. To the east the natural gorge of the Columbia River forms a funnel for masses of cold, dry air from the high plateau regions of Eastern Oregon, and from the south the Willamette Valley brings warm marine air from the Pacific Ocean.

This geographical location makes Portland a delightful place to live, but makes weather conditions difficult to predict. Prevailing winds are from the southwest, but during the months of December, January and February, cold fronts are apt to move in from the north or northeast. When this occurs, precipitation may take the form of rain, snow or sleet, subject to very rapid changes from one to the other.

During the winter of 1958-59, only two snowfalls occurred; the first was forecast for Sunday, January 4th at 4 pm and appeared very nearly on schedule; then later the same day the forecast was changed to "Silver Thaw" which did not appear.

The Weather Bureau notified the City Engineer's representative, who in turn alerted the responsible crews.

● **THIS picture shows the beginning of a condition that could rapidly and readily turn into a "Silver Thaw," with extreme damage and movement almost impossible.**

At the first appearance of snow in any quantities, the Street Cleaning Crews began sanding where necessary. In order that around the clock operations could be available, the morning shift of workers was called in at midnight instead of at the usual 8 a.m. By this shift of personnel, the situation was met with very little overtime and no need for additional personnel and equipment.

The major activity for the next 76 hours, until Wednesday evening, consisted of hand cleaning crosswalks in the downtown area and spreading crushed gravel on the packed snow to give traction to vehicles. A total of 800 cu. yds. of crushed gravel was spread by Wednesday evening when the storm was over and rising temperatures melted the remaining snow. Wednesday night mechanical street sweepers removed 100 cu. yards of the cleanest gravel from the streets and stockpiled it for use in subsequent trench backfill

● **THERE are twenty-three special coasting areas provided throughout the residential sections. This picture shows typical conditions after a winter snowfall ended.**

work. The second snowfall came as a surprise, and in a short time dumped six inches of wet snow on the city, but normal efforts by the regular crews again served to keep abreast of the situation and keep traffic moving. It soon became apparent in this instance that run-off was to be the major problem, and operations were shifted to cleaning and keeping open catch basins and storm drains. Again only regular crews were needed. The snow had melted away within 24 hours.

The only other difficulty encountered during the winter was rain and sleet that froze in higher elevations and kept sanding crews busy. Icing conditions in the heights may occur with little warning anytime between October and March. These heights are largely residential and contain many of the larger hospitals; they are west of the downtown business section and reached by long, winding roads with fairly steep grades.

The city itself is divided by the Willamette River; with the older downtown section on the west side and large residential areas with business communities on the east side. Much of the area immediately adjacent to both sides of the river is commercial. Eight bridges cross this river and when icing conditions begin, the approach ramps of the bridges form bottlenecks under the best of conditions. All these factors combine to make it necessary for this city to have an extremely flexible snow and ice control operation.

A very important feature of this plan is an adequate communications system consisting of 75 vehicles with two-way radio, with headquarters at Stanton Yard, our maintenance center. This radio system is monitored by the Police Department, which puts the Police cars and drivers at the scene of trouble spots and provides excellent coverage of the city during adverse weather conditions.

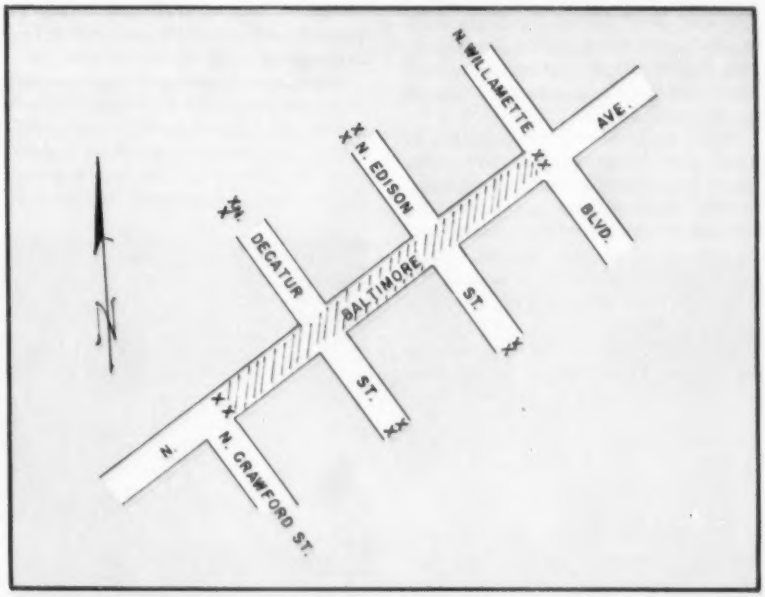
During the winter of 1949-50, considerable difficulty was encountered through lack of planning and improper use of equipment. After that experience, considerable time was spent in making up the realistic program the city now has. Each year an intensive training program is followed, through the medium of conferences. This acquaints all departments with their duties and the relationship of one to the other. It also makes known all the types and quantities of equipment available and how it can be brought rapidly into use. The training program also provides for the assignment of definite areas to each division, and the clear-cut plans laid for rapid transfer of forces from one section of the city to another. Every year icing poses a serious threat to traffic; and being near mountainous areas heavy snowfall must be expected at any time.

Plan of Operation

In order to meet this possibility under any combination of factors, the following plan has been prepared over the years and actual practice has proven the plan to be effective.

Under the direction of the City Engineer, the Maintenance Bureau of the Department of Public Works is divided into several divisions: 1.) Stanton yard; 2.) sewer repair; 3.) street repair; 4.) sidewalk repair; 5.) bridge repair; 6.) traffic maintenance; and 7.) street cleaning division.

Because of the nature of their function and the hours that they do the majority of their work, it usual-



● **HOW STREETS are barricaded to permit safe coasting. Twelve 3-ft. barricades are placed at points indicated by "X" as soon as possible after snowfall ends.**

● THIS is the type of snow plow used for most of the work. Full-scale operations begin when snowfall reaches a depth of about 6 inches with evidence of continuing.

ly falls on the shoulders of the Street Cleaning Division to take action first when snow begins to fall or ice begins to form.

In the event the U. S. Weather Bureau in Portland determines there is a probability of snow or freezing rain, they advise a representative of the City Engineer by telephone, at any hour, day or night. If they fail to contact this representative they call the City Engineer. Whoever they contact informs the Supervisor in charge of the division on duty to stand by for the conditions indicated. This forecast is always assumed to be correct.

When snow begins to fall or ice to form, the Street Cleaning Division takes immediate steps to maintain, insofar as possible, normal traffic throughout the city. Depending upon the hour of the day or night, residential slopes, streets leading to hospitals, downtown business districts, and the approaches to the bridges that span the Willamette River are sanded in order of importance. It should be stressed here that while snow is not a yearly occurrence, icing conditions in parts of the city are common, and snow or ice conditions vary from light to heavy in very short time intervals.

At all times during the Winter months a stockpile of fine crushed rock is maintained for immediate use. Four stand-by power-driven tail gate sanders, using ¼ to No. 10 crushed rock, are kept in readiness. Should conditions require their use, nine more sanders are available.

Should the severity of the storm demand more help, the City Engineer is notified by the Street Cleaning Division, and calls out the Street Repair Division. The zone of operations for the Street Repair Division is that area in the west hills where their snow plows and blades can be most readily used. This relieves the Street Cleaning Division and permits them to concentrate on bridges, arterials, and the downtown area.

Blades for trucks are kept stacked in the equipment building in such a way that they can be readily attached to the trucks. Most trucks used in this operation are 4-wheel drive, but if increased traction is needed on any of the trucks there is a covered ramp where assembly line methods are used to attach chains to all city vehicles as rapidly as required. The use of chains is kept to a minimum in order to prevent street surface damage.

In most cases these steps will be the only action required. But, should snow continue, it becomes necessary for the Sewer Division and Sidewalk, Bridge and Traffic Maintenance Divisions to be added to the work force. Then the operation broadens to include cleaning crosswalks and opening storm drains in the downtown area. Since this part of the city is flat, drainage becomes a factor. Our snow is usually wet pack and the temperature hovers near the freezing level causing rapid melting and consequent danger of basement flooding and hindrance of pedestrian traffic.

Full Scale Operations

When snowfall reaches a depth of approximately 6 inches on the ground with evidence of continuing, full scale operations are deemed necessary. Preparations are made for removal of snow only in the downtown areas; parking meters are hooded a few hours in advance of snow removal, which begins after business hours. The few cars remaining are towed away by the Police Department and replaced after snow removal crews have passed. Snow is bladed to the center of the street by four motor patrol graders. Our many one-way streets are an advantage here. An Athey Hi-Loader loads the snow into street cleaning trucks which carry it to the Harbor Wall of the Willamette River and dump it. Ten Wagner scoop-mobiles follow up and clear intersections. The avenues running east and west to the river are cleared first, with emphasis being placed

● MOTOR GRADER of the Street Repair Division cleans hilly residential street.

● **MOTOR blades make one pass out from the curb; snow is loaded into trucks and dumped at the harbor wall. Snow in center of street is not plowed or hauled away.**

on bus routes. Snow dumps are maintained at two locations on the river banks, each capable of accommodating four trucks at a time. It has been found that a layer of sawdust placed in the bed of each truck makes the unloading very simple and releases personnel for other duties. No scraping of the truck beds is necessary to dislodge the melting snow.

Should the snowfall or icing conditions become abnormal, the City Engineer will call in, besides the five hundred employees of the Public Works Department, the two hundred fifty additional personnel and supervisors, along with their equipment, of the Water Bureau, Park Bureau and the Paving Plant.

In the event conditions become abnormal in the extreme, the City Engineer has available a listing of all heavy equipment owned by private concerns within the City area, showing the person to contact for authorization of use of equipment along with a qualified operator. The Bureau of Unemployment of the State Employment Service can be contacted for laborers. This vast pool of men and equipment should be more than sufficient to handle any possible fall of snow or formation of ice that previous experience could lead this city to expect.

During the period of effort to return streets to normal, special provisions have been made to take care of hospitals, nursing homes, and other critical units where people might suffer hardship. Special provisions have also been made to provide fuel to people in isolated areas. This service covers all emergency calls, and each call received is evaluated at City Hall and passed on to the proper supervisor to handle.

In order that all snow removal equipment can be recognized as such, the city is adopting the yellow flashers used on State Highway equipment. These will be installed as soon as they can be procured.

Through the 100 percent cooperation of the children and the people living on streets where conditions permit, coasting areas have been designated. As soon as possible after a snowfall, city crews barricade the cross streets in these areas. To show the extent of feeling over these coasting areas, residents formed a human chain to protect the area and permit sliding to begin when city crews had been delayed. Such acts have been rewarded in turn by the attitude of the children. They help residents push their cars when needed, stay out of the way when people living in the area come home, and in general conduct themselves in orderly fashion.

City Police cooperate with Public Works Inspectors to maintain lanterns and barricades and help with any particular situations that may arise. If conditions prevent residents in the area from driving up the slopes to their homes, temporary sanding may be resorted to, and the slopes later recovered with snow so that coasting may resume.

There are twenty-three special coasting areas scattered throughout residential sections, in addition to the Parks that have suitable facilities and can be supervised by Park Bureau personnel.

The care and supervision given coasting have been successful in controlling accidents. During the days that coasting was possible in 1958-59, only one accident was reported. A child ran his sled into a tree in one of the Parks, with minor damage to both.

To conclude this it is desired to express appreciation to the following individuals whose cooperation made this article possible: John Colquhoun, Coordinator for the City Engineer; Les Davis, Supervisor, Bridge Repair, Sidewalk Repair, and Traffic Maintenance Divisions; Frank O. Woodruff, Supervisor, Street Cleaning Division; Art Rice, Supervisor Headquarters, Stanton Yard; Ted Suderburg, Supervisor, Sewer Repair Division; and Ray Schieve, Supervisor, Street Repair Division.

● **LOADER clears a windrow of snow from one of the narrower downtown streets.**

WINTER OPERATIONS

ON CONNECTICUT HIGHWAYS

JAMES W. MAHER,
Engineer of Roadway Maintenance,
Connecticut State Highway Department

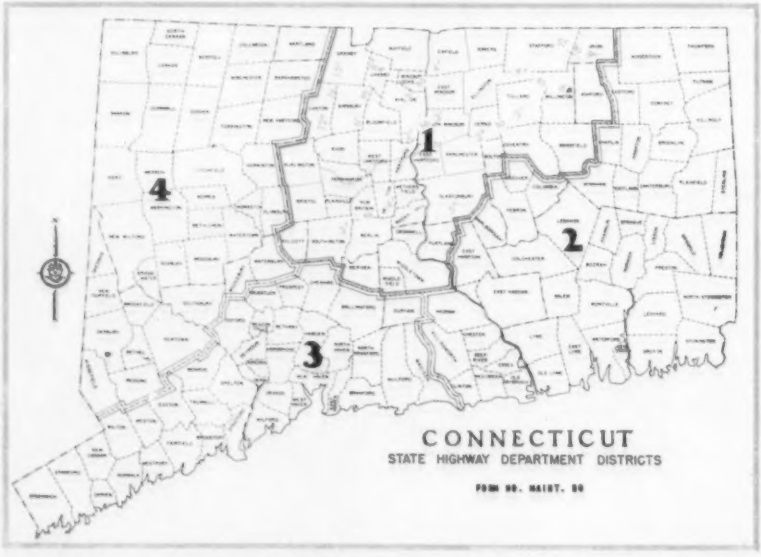
WINTER OPERATIONS in Connecticut service approximately 3,289 miles of state highway of which approximately 455 miles are dual type. The state highway network extends from the south shore, on Long Island Sound, northerly to the Massachusetts state line, a distance of approximately 60 miles, and from the New York state line on the west to the Rhode Island state line on the east, a distance of approximately 110 miles.

Snow storms may occur as early as November 15th in the northwestern part of the State, and as late as April 15th. At Bradley Field, in Windsor Locks—just north of Hartford—the average snowfall from 1954-55 season through 1957-58 season was 49.5 ins.; and at Hartford, for the same period, it averaged 40.8 ins. The average for the current winter has not yet been figured because records indicate that during the past 5 years Connecticut has had an average of 4 to 5 ins. of snow in April. Over a longer period of time, the average for April is 1.4 ins. For the 1958-59 winter, Bradley Field showed approximately 34 ins., and the Hartford area about 31 ins.

In dealing with snow and ice conditions, the primary policy of this Department is to provide, in accordance with statute or precedent and within a limited cost, the greatest aid to the greatest number of the traveling public on state-maintained highways.

Section #2262 of the General Statutes, State of Connecticut, specifies that "the Highway Commissioner shall cause the removal of snow from any completed portion of any trunk line highway when the accumulation thereof shall render such highway unsafe or impassable for public travel."

Connecticut is divided into four districts, each in charge of a District Engineer. Maintenance within each district is in charge of a Division Engineer of Maintenance; operations are in charge of an Operations Engineer. Each district, for maintenance purposes, is divided into three divisions, each in charge of a General Foreman, and each division is subdivided into foremen's



● DEPTH of snowfall at various points during Storm No. 21, March 27-28, 1959.

● **THIS typical section garage has facilities for storage of five trucks and related equipment, plus office space for the foreman and toilet and heating facilities.**

areas, which again are divided into sections in charge of Crew Leaders. Each Foreman is in charge of three Crew Leaders.

Each year, about two months prior to the winter season, a schedule of routes is set up by the districts, and assignments of trucks and personnel are made. The length of the runs varies due to several factors such as type and density of travel, width of pavement, alinement and grades of roads. Routes assigned to each truck for snow removal are the same as those for sanding of icy pavements.

The assignment data is prepared in mimeographed booklets by each district and distributed to administrative personnel, State Police, and others whose duties involve snow and ice control. The General Foremen with the Operations Engineers present one of the booklets together with area maps to each of the State Police Barracks within their territories, and agree upon the arrangements which would be of material benefit during the winter season. The Highway Department cooperates as closely as possible with the Connecticut State Police Department.

After the assignments of routes to trucks and personnel, it is the duty of the Foremen to make the men thoroughly familiar with their assignments and with winter procedure. Dry run instructions in the operation of the equipment are given. Although the mileage under each Foreman varies, the average is approximately 6.1 miles.

Every employee who has been assigned a specific storm duty is subject to 24 hour call during the winter, and must keep himself available for work at all times.

Each District Engineer is held responsible for the planning of winter operations and for maintaining satisfactory road conditions within his district. Our present organization for winter maintenance operations consists of about 1,400 regular men in various labor classifications. Department-owned equipment used on snow and ice work includes the following: 203 heavy trucks with Jet sanders; 376 heavy trucks with trailer type sanders; 26 graders; 962 plows, reversible, one-way, and "V" type; 66 front end loaders; 15 bucket loaders; 2 power shovels; and 80 belt conveyors.

This equipment is distributed to the Foremen, allotment being in accordance with the needs of their particular areas.

In addition to the regular fleet of trucks, the Department rents—under competitive bids—96 trucks which are used to augment the regular fleet and, insofar as possible, work in echelon with one of the department trucks.

In addition to standard lighting equipment, state trucks are equipped with dual flashing lights mounted in such a manner as to indicate the position of the truck body width.

Weather Forecasting Service

The Highway Department relies on the Travelers Weather Service, a branch of the Research Department of Travelers Insurance Company of

Storm #21 — DISTRICT #1 - NORTHERN DIVISION — M. Franconi, Gen. Foreman
March 27, 1959

Rain changed to snow between 0600 and 0630. Temp. 30 to 32. All crews called by 0900. Simsbury crew for North Granby area called at 0700.

1110. Snowing hard; making quite fast. Temp. 32. 3" to 4" accumulation. Most towns adjacent to Connecticut River have light cover of slush, but as you travel east and west, the roads are covering with heavy wet snow. Crews plowing.

1255. Moderate snow. Temp. 35. Accumulation 4" generally, with 5" to 6" on Rt. 116, 179 and Road 922. Higher elevation roads in most areas bare and wet.

1530. Light snow. Temp. 33 to 34. No further accumulation. Roads bare and wet. Temp. seems to be dropping; crews standing by.

1800. Sleet reported throughout this section from 1645 to 1730. At the present time, light snow. Temp. 31. Crews sanding where needed.

2130. Light to moderate snow. Temp. 27. Roads spot froze in all sections. Strong winds causing drifting and covering of roads. Crews plowing.

March 28, 1959.

0300. Light to moderate snow; drifting. Temp. 26. Roads snow covered and slippery. Crews sanding and plowing.

0620. Stopped storming around 0430. Overcast broken up. Temp. 25. All roads have light glazed coat. Crews sanding in.

0900. Temp. 34. Roads bare and wet in most areas; others have light slush cover. 12" to 15" accumulation in the higher elevations, Rt. 116,179,189 and Rd. 922; 6" to 8", Avon, Simsbury, Granby and Suffield; 3" to 4", Enfield, Windsor Locks, East Windsor and 2" to 3" in Hartford, Windsor and East Windsor.

Storm #21 — DISTRICT #1 - SOUTHERN DIVISION — R. T. Cahill, Gen. Foreman
March 27, 1959

Rain changed to snow between 0600 and 0630. Temp. 32. Parish out at 0900. All crews were called by 1000.

1100. Snowing hard. Temp. 32. 1" to 1½" accumulation, Hartford area; generally melting on heavily traveled roads; making on secondary roads. 2" to 3" accumulation in western towns; making on roads. All crews plowing.

1250. Light snow; seems to be stopping. Temp. 34 in Meriden and Newington; 40 in Southington. Accumulation generally 3", but Rt. 94, Glastonbury reported 5" and still snowing moderately. Most roads generally bare and wet. No accidents or tie-ups reported. If temperature continues to rise, crews should be released shortly.

1400. Stopped storming at 1330. All roads bare and wet; crews starting to report in; some have a little patching to do.

1440. All crews should be in by 1500.

1630. Starting to snow again lightly. Melting on wet roads. Temp. 32. Jets recalled in this section at 1730. Light snow continued and spot freezing of roads occuring in Bristol, Wolcott and Southington, requiring Goodsell and Parish to recall all crews at 2230, and by 2400 all crews in this section had to be recalled. Wet roads had spot froze. Temp. 26. All sections report high winds with drifting.

March 28, 1959.

0200. Light to moderate snow. Temp. 26. Roads snow covered and slippery. Crews sanding, salting and plowing as required. No accidents or tie-ups reported.

0600. Stopped storming around 0430. Temp. 24. Roads have light glaze. Crews to sand in. Temp. predicted to reach 40. Truck 27-018 and 2-1155 not available for this storm. Need new brakes and new motor. Truck 27-013 out with broken sprocket at 1400 on 3-27-59.

0730. Clear skies. Temp. 28. Roads have light glazed coat, well sanded. Salt working; roads starting to turn wet. Temp. 28. All crews should be in between 0800 and 0900. No contractors called for this storm. Truck #2-1319 and 2-1322 out with motor troubles for entire storm.

● **DIARY form of report submitted by each Division provides statistical data.**

Hartford, and on the U. S. Weather Bureau at Bradley Field. In 1955, Commissioner Newman E. Argraves agreed to a cooperative plan with Travelers, in conjunction with the U. S. Weather Bureau and the State Police Department, whereby we would assist in obtaining technical weather information in return for forecasts of probable weather conditions.

The topographic and geographic environment of Connecticut influences winter precipitation to the extent that it is not unusual to find rain along the coast, freezing rain inland, and sleet or snow in the northern and northwestern portions. Sudden shifts in winds and a drop in temperature can cause quick changes in Connecticut weather conditions.

The program of the Travelers Weather Service encompasses a detailed analysis of Connecticut weather before, during and after storms. In addition to making full use of all the data assembled throughout the United States by the U. S. Weather Bureau, the Travelers schedule calls for state-wide observations of factors influencing the weather in Connecticut. These observations enable them to pinpoint probable conditions regionally within the State with a greater degree of accuracy.

The Highway Department purchased, and installed on state property, the equipment for seven weather reporting stations which are located at strategic points and are manned by State personnel who report on a schedule and under instruction from Travelers Weather Service. The instruments at these stations consist of recording thermometers and either a microbarograph or an Aneroid Barometer, wind and precipitation gauges.

Data reported to Travelers Weather Service is in turn forwarded by them to the U. S. Weather Bureau at Bradley Field, Windsor Locks. This service has helped our operations considerably, as we have often been advised of sudden changes in weather conditions and a resultant savings in certain operations has occurred; or, we have been advised of unexpected developments which have required us to change our plan of operation.

All data thus collected are eventually forwarded to the Weather Records Processing Center in Asheville, North Carolina, where they will remain on file and available for reference when desired.

The data received from our weather station installations are also valuable during periods of heavy rainfall, when there is a possibility of high water conditions.

The office of the Engineer of Roadway Maintenance makes the arrangements for obtaining the weather forecasts. These are obtained daily during the winter season, at a particular time. In the event the Department has been advised of a particular storm in the offing which might require winter operations, headquarters keeps in constant touch with the Weather Service. The forecasts give information as to type of precipitation to be expected, its probable arrival time within the State, the intensity, and the expected duration. This information is then relayed by radio to the maintenance personnel in each of the four districts.

● **AFTER the road has been plowed and is open to traffic, a truck-mounted wing extension is used to cut back drifts. The Department owns 962 plows of all types.**

General Procedure

Storms generally enter our State from a westerly quadrant. When a storm starts in any district, the information is relayed by phone to the office of the Engineer of Roadway Maintenance, Wethersfield, during working hours, or to a storm coordinator if after hours, and the information is relayed to all other districts so they will be on the alert.

The offices of the districts' Division Engineers of Maintenance and of the Engineer of Roadway Maintenance (at headquarters) are manned during winter storms, and field personnel are instructed to report in regularly as to conditions during the storm. The information is logged for future study. As soon as possible after each storm, a "Winter Storm Report" form is submitted by each district to the office of the Engineer of Roadway Maintenance.

For snow removal, the trucks operate in echelon, about 750 feet apart, the number of trucks in echelon being governed by the width of pavement and shoulder. Snow removal operations start as soon as the snow is of sufficient depth to plow, and continue to the end of the storm.

Use of Chlorides & Abrasives

At the beginning of a storm, before plowing is necessary, crews make an application of straight salt at the rate of 300 to 500 pounds to the mile on 2-lane divided highways, holding to the centerline of the pavement for the entire length of run. Width of spread and rate of application is determined by the width of pavement. A mixture of sand and salt (1-part salt to 8-parts sand) is applied on grades and curves. When this has been done, the trucks regroup and plowing operations are started.

Department instructions are that plows must be on the trucks at the start of the sand-salt operations so that no time is lost in attaching them for snow plowing.

During ice storms, the crews may use either the straight salt or the 1-to-8 salt-sand mixture.

The Department conducted observations during the past winter, to compare results obtained by the use of treated abrasives with chemicals, the use of a combination of chemicals, and the use of straight chemicals, as follows:

1) Sand and calcium chloride (5 to 1).

2) Sand and rock salt (5 to 1).

3) Rock salt and calcium chloride (4 to 1).

4) Straight rock salt.

The majority of the snow storms of this 1958-59 winter, however, were not of sufficient length or depth to allow us to arrive at any definite conclusions. The Department intends to continue the experiments on a broader scale during the 1959-

60 winter, and may possibly eliminate the combination found not productive of the desired results.

The cost of snow and ice operations runs about 30 percent of the Department's total roadway maintenance costs.

Sand used for winter operations is taken either from storage piles set up at strategic locations, or directly from a commercial vendor's plant. The storage piles are prepared prior to the winter season and are refilled as necessary. Selection of sand pile locations is integrated with truck assignments so that as many piles as possible are loading points for a large number of trucks. Floodlight illumination is provided at all such piles where electric service is available, and shelters of approved design are erected for equipment operators who are assigned to remain at the storage piles throughout the storm. All storage sandpiles are located on state property, and mechanical equipment is used for loading.

On hills and grades, the department places boxes filled with sand mixed with chloride to prevent freezing. This is done prior to November 15th, and the boxes are refilled as necessary. These are intended for emergency use by motorists.

In October of each year, quotations are received from sand vendors, covering a 12-month period starting the following November 1st. Quotations are on both a per-yard and a per-ton basis, as follows:

Price per ton or yard at plant.

Price per ton or yard at plant and loaded by vendor.

Price per ton or yard delivered.

Sand must conform to approved highway department specifications. Special precautions are taken by state personnel to insure that oversize particles are excluded, since they could be damaging to State equipment as well as to vehicles of the traveling public.

Chlorides

Yearly quotations are received for chlorides delivered by rail or truck. The major portion of the requirements for sodium chloride is delivered in bulk, while calcium chloride is delivered in bags. Deliveries are made in late summer.

Sheds have been built in several locations for protected storage of chlorides, but in some areas outside storage is used. Bulk material is placed within an enclosure that is open on one end, with sides approximately 4 to 5 ft. high, and covered with waterproof paper. At each of these locations, either a belt conveyor or a front end loader is used to place the material on our trucks. Following is the policy on the use of sodium chloride:

1) Salt shall be applied straight —at the start of a storm—at the rate of 300-500 pounds to a mile on two lane pavement. On three or four lane pavement, the amount shall be increased to 600-1000 pounds per mile, and two trucks used for the operation, dividing the pavement for the operation and taking into consideration the cross section of the pavement.

The salt shall be applied either in a windrow or broadcast over a predetermined width by Jet sander or similar type of spreader. This spread shall be continuous and is to be made from the center of the line of two lanes of pavement and to each side. The variation in the amount of salt used is, of course, dependent on the width of road.

2) Salt and sand mixture, using 1-part salt to 8-parts sand, shall be used on grades, curves and intersections. This is in addition to the straight salt applied initially on these areas.

3) Salt and sand mixture, using 1-part salt to 8-parts sand, shall be used during glazing conditions which develop because of freezing rain. Straight salt may also be used, but the salt and sand mix will give an abrasive as well as a preventive action.

4) Salt and sand mixture, using 1-part salt to 8-parts sand, can be used during periods of snow flurry activity where this type of precipitation is causing slippery conditions.

NOTE: It is understood that it may be necessary to repeat treatment under any of the four situations mentioned above. It is imperative, in order to get desired results, that salting begin at the start of each storm. We should not wait until there is an accumulation.

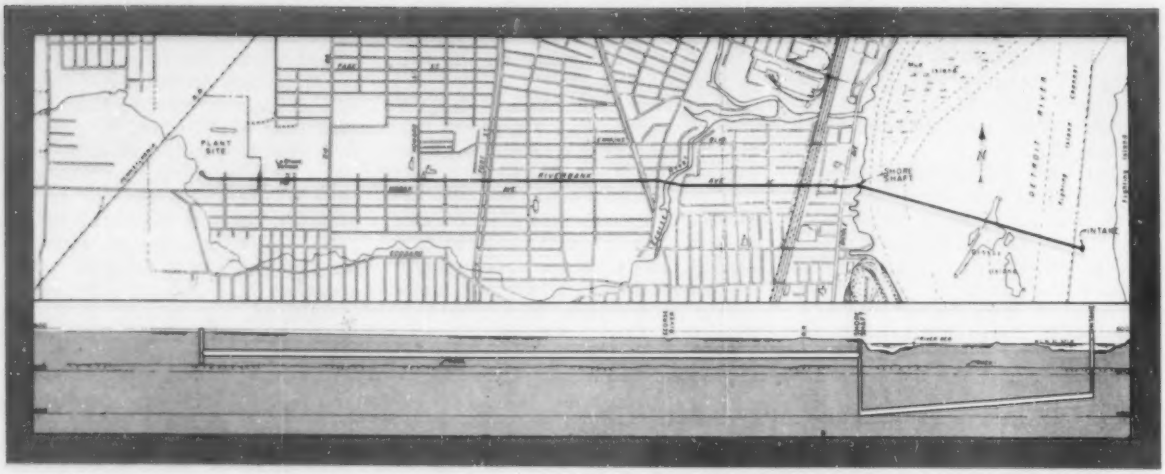
Last winter, the Department used approximately 42,000 tons of salt, 70 tons of calcium chloride flakes, and 1150 tons of Peladow. The use of chlorides has increased each year. Their use is a vital part of Connecticut's winter snow and ice control program, and all personnel is impressed with the importance of their use and the proper method of application. It is well-nigh impossible to compute the amount of money saved through the use of chlorides, both by the State and by the users of the highway system.

The annual preparation of winter maintenance equipment actually starts at the end of the winter season when all plows, sand spreaders, and other snow and ice equipment are inspected, overhauled or repaired, ready for use before the onset of another winter.

● **FOR HEAVY plowing in deep drifts and for widening in cuts, the Sno-Go is used. This is one unit of some 900 pieces of snow fighting equipment operated by the State.**

All maintenance equipment is maintained by the Bureau of Property Control. Repair shops are located in each General Foreman's area, manned by competent mechanics who handle all servicing and repair work. All but two of these repair shops are in state-owned buildings. Regular schedules are set up for servicing and general check-up of all automotive equipment. A Stores Section is an integral part of the setup at each repair shop, and a supply of the more frequently used replacement parts is available for the automotive equipment.

Keeping Connecticut's state highways usable during the winter months is hard work requiring, at times, long hours and herculean effort. In the final analysis, plans, preparations and equipment are but complements to the loyalty of the men who, on occasion, fight winter's elements around the clock.



● ROUTE and elevation of the Wayne County Water Tunnel. Shafts are 14 and 16-ft. diameter; tunnel is 12-ft. diameter.

PNEUMATIC POWER
SPEEDS CONSTRUCTION of a WATER TUNNEL

AIR POWER is playing a major role and finding new uses in construction of the Wayne County, Mich., four-mile raw water tunnel. It is standard procedure, of course, to use compressed air in tunnel jobs to run drills, clay diggers and other tools and to pressurize the tunnel. In the Wayne County job, Ingersoll-Rand air motors are used to power the hydraulic systems that position the tunnel liner concrete blocks and shove the shields through the clay. Air motors also handle the forms for the poured concrete lining and propel the form carrier.

The Wayne County project is designed to meet the long-range water requirements of a populous area extending south and west from the City of Detroit. After a survey, the consulting engineers, Hazen and Sawyer of New York, reported to the Board of County Road Commissioners in 1955 that they had found an urgent need for additional water supply facilities: "The County is growing rapidly with new industrial plants and housing developments springing up almost overnight. The downriver area of Wayne County is the one remaining section of metropolitan Detroit where industries can enjoy low-cost water transportation and can obtain unlimited quantities of water for industrial purposes. Development of the downriver area for industrial sites is sure to bring a large influx of population in the adjacent areas."

Population in the whole potential service area was estimated at 565,000 by 1960, growing to 1,500,000 in the following 50 years. Average daily water demand was placed at 70 mgd in 1960, growing to 240 mgd by 2010, and maximum demand was placed at double these figures. It was decided that the County should provide basic water supply facilities rather than continue virtually total dependence on supplies purchased from the City of Detroit. The New York engineering firm of Parsons, Brinckerhoff, Hall & MacDonald was retained to design an intake structure and tunnels to carry water from the Detroit River off Fighting Island to a new filter plant and pumping station to be designed by Hazen and Sawyer. Since intake structures and tunnels are difficult and expensive to enlarge, it was deemed advisable to make the initial facilities large enough to handle the ultimate foreseeable demand of 480 mgd.

The project divides naturally into three segments: The intake structure founded on rock in the bed of the river with a 14-ft. shaft down to the start of the river tunnel which has a top elevation of 450 ft. at this point. A 12-ft. river tunnel extending for approximately a mile through rock under the river at a descending grade of 0.80 percent to the 16-ft. shore shaft which goes down to an elevation of 400.28 ft. The land tunnel has an inside diameter of 12 ft. and extends from the shore shaft at a top elevation of 554.30 ft. through clay for 15,500 ft., reaching the purification plant intake shaft at a top elevation of 548.00 ft. With lowest recorded river level at an elevation of 568.80 ft., the maximum designed flow is assured without pumping.

Tunnel Contract

The land tunnel was awarded to GFS Associates, a combine of three construction companies: The Fattore Co. and Louis Garvagalia Contractors, Inc., of Center Line, Mich.; and the Santucci Construction Co. of Skokie, Ill. The contractors started in March, 1958, to sink a central work shaft in a broad traffic island on Fort Street in Lincoln Park, Mich. From this shaft they will tunnel roughly 9,000 ft. to the east to the shore shaft and 7,000 ft. west to the purification plant. An artesian stream was encountered in May with the complication of sulphur water and gas, but this was successfully grouted and the shaft finished in August. The shields to be used on the two headings were installed late in August. By the end of October, the tunneling had progressed 470 ft. west and 423 ft. east. Work then stopped to place the concrete inner lining for the initial section and to install the air locks. In late November operations went on a three-shift basis for the duration of the project.

The tunnel walls are formed of a primary lining of concrete O'Rourke blocks 16 in. thick and 30 in. wide with seven full and two half blocks forming a complete ring. On this project, for the first time,

the blocks are made by a machine designed and built by Fattore and Garavagalia. A 14-in. secondary lining of concrete is poured to bring wall thickness to 30 in.

The shields, designed by Louis Tabor, GFS project manager and chief engineer, have an outside diameter of 17 ft. 5¼ in. and are 12 ft. 6 in. long. Clay broken by the hard edge of the shield flows through four ports which are varied from 6 x 12 in. to 18 x 24 in. to fit hardness of the soil and allow passage of boulders. The hydraulically-operated erector arm mounted on the shield lifts the 3150-lb. concrete blocks into position where they are engaged and held by sixteen 150-ton jacks. When a full hydraulic force is exerted by the jacks against blocks on one side and the shield on the other, the shield is pushed through the clay with a pressure of 5,000 to 6,000 psi.

The Rodgers hydraulic system and the Ingersoll-Rand air motor that powers it are carried on a jumbo directly behind the shield. The Size 201RM6 air motor drives three hydraulic pumps, one high pressure Rodgers pump with 10,000 psi capacity but operated here at 6,000 lbs., and two low pressure Vickers pumps operated at 1,000 psi. The high pressure system powers the jacks to force the shield forward. Then, when it has moved enough to make room for another ring of blocks, the low pressure system retracts the jacks. The high pressure pump operates the erector arm to position the blocks and the low pressure system then pushes out the jacks to hold them. The cycle then repeats with the high pressure system activating the small 6¼-in. rams of the jacks to push the shield forward.

The I-R air motor drives directly the two low pressure pumps on a single shaft and drives the high pressure unit through a sprocket. The motor operates continuously and an air motor was chosen for this application because it would not overheat and burn out. Electric motors were at a further disadvantage because of low voltage and the unavailability of 3 phase current. Air motors were considered safer for tunnel work since they are inherently explosion-proof. Also, since they require no cooling, they are more resistant to corrosive atmospheres. The air motor is driven by 90-lb. air supplied by an Ingersoll-Rand XCB compressor which also powers the air tools. An added dividend is the use of exhaust air from the air motors to help pressurize the tunnel.

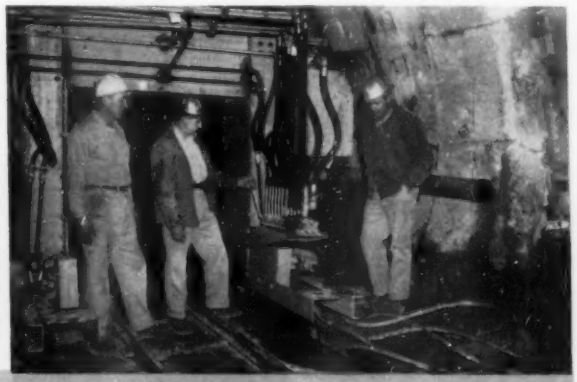
The clay is extruded through the shield ports and is carried away in mine cars on two lines of track. When boulders block the way, they are dug out with air-powered clay diggers.

After the primary lining of blocks is in place, forms are erected for the poured secondary concrete lining. The Blaw-Knox form carrier uses three air motors, two to propel the carrier down the track and one to power the hydraulic system. The larger motor drives a Vickers hydraulic pump which operates two sets of jacks, one to raise the carrier and the other for stripping forms. Air motors have the same advantages in these applications that were described in discussing the shields.

Compressed air plays a conventional role, incidentally, in the pouring of the secondary lining. A number of I-R air-operated vibrators are used to keep the concrete from honeycombing. Air power has been used also on this project to run sump pumps, Jackhammers, Impactools and other tools.

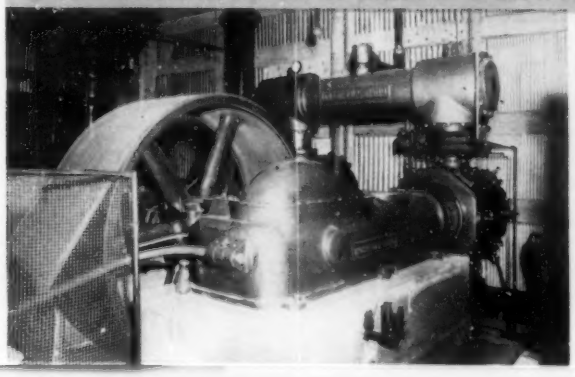
To provide low-pressure air to pressurize the tunnel, the contractors installed three Ingersoll-Rand ESH compressors. These 1250 cfm units have 17-in. bore and 11-in. stroke and deliver air at a pressure of 25 psi.

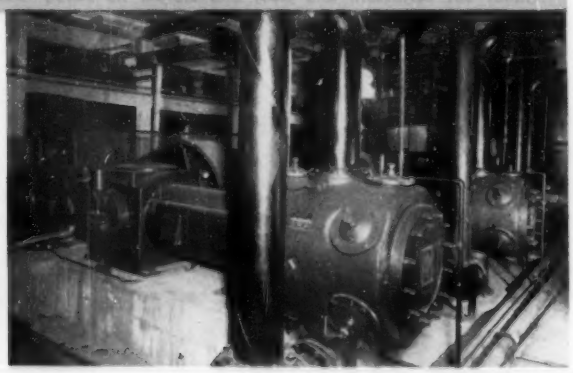
With early delays and preparatory work out of the way, the job is moving at full speed and the contractors hope for completion by the fall of 1959, substantially faster than original estimates.



● **SECTION** of the tunnel, at left above, has primary lining of concrete blocks in place. Form carrier is shown at right. Three air motors are used on this unit, two to propel the carrier and a third to power hydraulic system.

● **COMPRESSORS** for high and low pressure air (l. and r. below) power air motors and tools and pressurize the tunnel.





PITTSBURGH'S APPROACH TO Traffic Planning

MICHAEL J. GITTENS,
Traffic Engineer,
Pittsburgh, Pennsylvania

PITTSBURGH, like many other cities, experiences changing traffic patterns. Population trends, land use, and construction of new roads are the important factors influencing traffic requirements. The population of the City, according to recent estimates, remained relatively constant from 1950 to 1959. The leveling off of City growth did not stabilize traffic patterns, however, because the population of Allegheny County increased from one and one-half million to one and two-thirds million during the same period. Rapid growth of suburban residential areas and the construction of new highways cause travel distances to become greater without appreciably changing the average travel time; but use of the private vehicle increases with respect to miles of travel from home to place of employment, to shopping districts, or to business establishments.

Careful planning is required in order to make most effective use of the means available for relieving traffic problems. In evaluating the tools that can be used to aid traffic movement, the most important consideration is the annual allotment of funds for traffic engineering. The Bureau of Traffic Planning receives $754,000 annually for the installation and maintenance of traffic signs, street name signs, and street markings; for the maintenance of parking meters and traffic signals; for payment of electrical current consumption in the amount of $45,000 per year; and for the traffic planning and administrative staff. An annual appropriation of $75,000 is allotted for capital improvements such as the installation of new traffic signals, extensive signal improvements, or the erection of overhead directional signs.

Every effort is made to increase highway capacities by making effective use of street space and by utilizing traffic control devices in the most practical manner. Parking regulations in the Central Business District and on principal through streets prohibit or restrict curb parking as required. Traffic signs, street markings, and traffic signals are used to the limits of the budget appropriations. A careful analysis must be made of design features, types of equipment, and installation procedures in order to obtain the greatest value for available funds.

The installation, operation, and maintenance of traffic signal equipment provide useful examples of planning procedures. Minor installations are made in the most suitable manner that will accomplish the desired purpose without employing complex control equipment. Figure 1 illustrates a pedestrian control signal, serving several industrial plants, a church, and two schools. The closest signal controlled intersections on this major thoroughfare are located one-quarter mile and one-half mile away in opposite directions from the pedestrian crosswalk. The street carries 20,000 vehicles a day, and is posted with a 35 mile per hour speed limit. The signal is operated with pedestrian push-buttons and was installed at a cost of $1,850.

A temporary signal, Figure 2, was installed at the merge point where traffic from the Penn-Lincoln Parkway, a controlled access freeway, enters the Boulevard of the Allies. Temporarily, the Boulevard is used for the rerouting of Parkway traffic. The traffic flow at this point will remain heavy until the Parkway is completed into the Central Business District. The intersection was designed for free flowing traffic. The signal installation contains a minimum of equipment, mounted on one pole, with the signal units extending over the traffic lanes to provide good visibility. Installations of this type are made by the Bureau of Traffic Planning's construction crew.

● **FIG. 1. PEDESTRIAN control signal which is operated by push-buttons. This busy street carries up to 20,000 vehicles each day.**

All photos courtesy Photographic Section, Bureau of Police

● **FIG. 2. TEMPORARY signal installed at a merge point to control traffic during rerouting because of construction.**

● FIG. 3. THIS major intersection is equipped with multi-dial control which allows push-button operation by a traffic officer.

● FIG. 4. MINOR intersection crossing heavily traveled artery is protected by treadles and pedestrian push-button controls.

Requests for Traffic Signals

Requests for traffic signals are studied carefully and each new installation meets the recommended volume warrants. The type of control equipment selected for an intersection varies with respect to the particular traffic conditions. Single-dial fixed-cycle controllers are used for the control of traffic flow under normal conditions at isolated intersections, where the flow patterns do not change substantially throughout the day. Where intersection capacity has not reached a critical stage, but the flow pattern changes with regularity, multi-dial controllers equipped with time-clocks for selecting various cycle lengths and adjusting the proportions of time allotted to the intersection approaches satisfactorily regulate the flow of traffic. Figure 3 illustrates traffic conditions at an intersection equipped with a multi-dial controller, supplemented with push-button operation for traffic officer control during periods of heavy traffic volumes.

At intersections where a minor movement of vehicles and pedestrians enters or crosses a major thoroughfare, semi-actuation of the signals is provided through the installation of treadles and pedestrian push-buttons. This type of intersection is illustrated in Figure 4. A sign erected below the pole-mounted signal face permits left turns into the cross street while a red signal aspect is displayed on the main street.

At many locations, more intricate equipment is required to control the flow patterns. Where heavy traffic volumes converge or cross each other, and the number of vehicles exceeds the design capacity of the intersection, no limit is placed on the amount of money expended or type of equipment purchased to ease traffic flow. Figure 5 illustrates a signal installation at an intersection carrying 20,000 vehicles per day. Radar detectors are used to determine relative traffic volumes on the approaches to the intersection, and a volume-density type controller establishes the distribution of signal time on the basis of traffic demands. The controller takes into account the instantaneous volume of traffic on the street having the green signal, the number of cars waiting against a red signal, and the interval of waiting time. At the T intersection shown in the figure, three radar detectors were used, one on each approach, together with post mounted and suspended signal units. The cost of this installation was $14,500.

Last, and probably most important, is the selection of control equipment for the interconnected signal system in the Central Business District. The CBD is 0.52 square mile in area, having 0.18 square mile of street area. Reference to

● FIG. 5. SIGNAL installation at intersection carrying 20,000 vehicles daily uses radar detectors to establish distribution of signal time on basis of traffic volume.

Figure 6 indicates that rectangular blocks are bordered by a triangle. This combination of configurations results in the formation of many small triangular blocks, having short sides and little storage capacity. Signalized intersections are located within 130 feet of each other on heavily traveled streets.

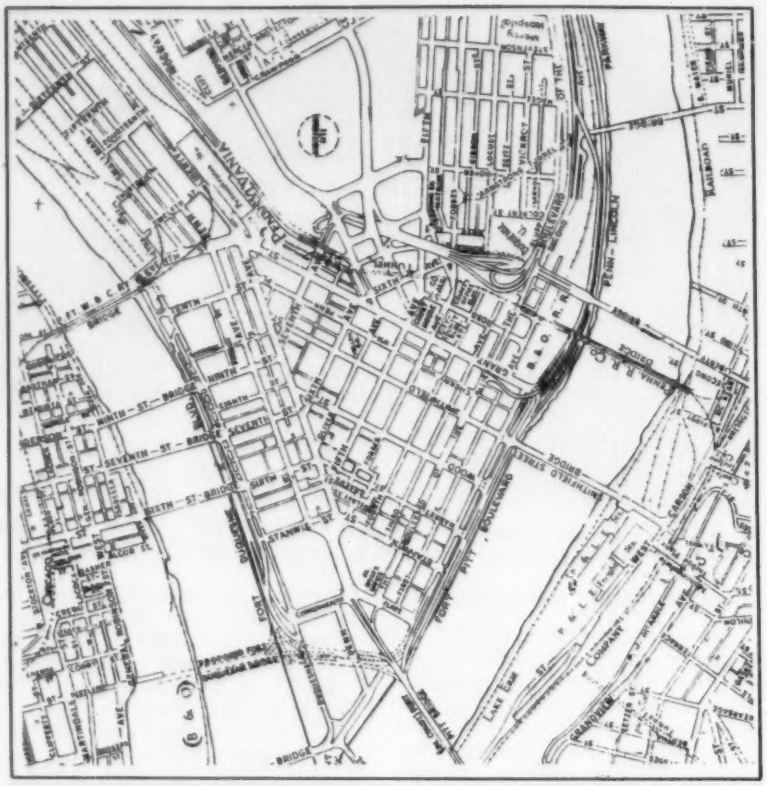
The Downtown signal system consists of 85 intersections, interconnected by cable, and supervised with a master controller. The secondary controllers at the intersections are three-dial expansible type. At present, the signal cycle is 50 seconds in length. This cycle length is frequently looked upon as being too short, but many of the blocks in the Downtown area do not provide ample storage space to accommodate the number of vehicles that would back up during longer phases of red signal time.

Careful consideration has been given to the possibility of using detectors in conjunction with the volume-density type of control equipment, and advice has been solicited from engineers employed by manufacturers. A question remains concerning the efficiency of this equipment under existing conditions. The Downtown street pattern, being very irregular in shape, presents an unusual problem.

Figure 7 illustrates a typical corner installation in the Downtown district. Attention is called to the traffic signal mounted on a mast arm, increasing the distance between the vehicular and pedestrian indications. The pedestrian signals operate from 7:00 AM to 10:00 PM, and the illuminated one-way arrows operate in accordance with the hours of darkness.

In general practice, mast arm mountings and overhead signal units, suspended from messenger wire, supplement units erected on corner poles. Every new installation provides two signal faces on each approach to the intersection, and an attempt is made to place signals in line with vehicular lanes and pedestrian crosswalks. Figure 8 illustrates lane signals on the Liberty Bridge, where reversible lane operation is used during the morning and evening peak periods.

This discussion indicates that new installations and improvements follow a fixed pattern, limited by budget appropriations and practical thinking. We also do some dreaming. It is hoped that funds can be accumulated to install radio interconnection for outlying signal systems and isolated signals; for special traffic control devices; and for emergency rerouting of traffic. In the meantime, telephone lines will be used to coordinate outlying signalized intersections and for the operation of special illuminated signs.



● **FIG. 6. Central Business District, 0.52 square mile in area and irregular, has 85 intersections interconnected by cable and supervised by a master controller.**

● **FIG. 7. THIS typical downtown signal installation includes illuminated arrow and pedestrian indications.**

● **FIG. 8. LANE signals on the Liberty Bridge where reversible lane operation is used during the morning and evening peak periods.**

Safety Practices at Sanitary Landfills

LEROY W. VAN KLEECK,
Principal Sanitary Engineer,
Connecticut State Department of Health

IN THE OPERATION of a sanitary landfill for refuse disposal, the avoidance of nuisance through proper engineering practices is the major consideration. However, since trucks, passenger cars, bulldozers and other equipment are in motion at the site of a landfill operation, it is obvious that safety to the operators and public deserves attention. There are also hazards from dust, from the possibility of fires and from contamination to persons from the refuse itself.

Area Safety — The entrance to landfill areas should be locked at night. During operating hours adequate signs are needed to designate the location of the dumping area. Depending on the incoming traffic, the day's designated dumping area should be limited in width.

In case of fire, a dependable water supply from hydrants or portable pumps drawing water from near-by ponds or streams will control and extinguish such fires and avoid a hazard to vehicles and persons, as well as preventing nuisance. A water supply will also control the blowing of dust when this occurs.

Employee Safety — Walking on uncompacted (or even compacted) refuse is a hazard to operating personnel from wire, glass and other waste materials which may cause physical injuries. For a similar reason it is best to segregate hazardous materials at sanitary landfill sites or prohibit their acceptance. Highly flammable materials, such as sawdust, plastics and ground rubber, can be dumped in a special area and promptly buried with an adequate earth cover. Highly hazardous materials, such as discarded bullets, fuses, volatile solvents, and radioactive materials, should not be accepted.

● **SIGN should indicate dumping area which must be restricted to permit adequate compaction and proper covering.**

Equipment Control—Bulldozers or other compacting equipment should not operate in the dumping area while refuse is being dumped from trucks or private cars.

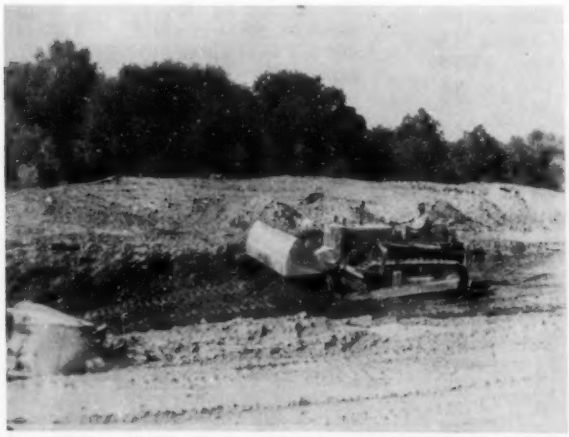
The working of compacting machines on too steep slopes or near swamps may capsize the equipment and cause injury to the operator. The racing of equipment is also unsafe practice. Operating personnel should not work excessive hours at one time—fatigue often results, and this sets the stage for inattentiveness, carelessness and other physiological factors conducive to accidents.

General Safety — Salvaging of wastes in refuse interferes with an efficient sanitary landfill operation, and there is a hazard to personnel from contaminated materials, from cuts, from tripping over rolled wire and other materials, and from the possibility of body burns from spontaneous combustion of highly flammable refuse. These are reasons enough to prohibit salvaging.

A sanitary landfill site should be in the charge of a foreman who has received training by management in conducting a proper and safe operation. In the case of small to medium-sized communities this means training of the equipment operator, who usually manages the entire operation.

Maintenance of a completed landfill needs periodic maintenance, until it is fully stabilized. This includes repair and filling of cracks, depressions and erosion of the surface or side slopes.

An adequate earth barrier, possibly of impervious material, may be necessary to prevent the eruption of methane gas on private property immediately adjacent to the site. Experience at several locations indicates that building construction should be avoided for at least several years to permit surface settlement. Because of the hazard from methane gas, structures on landfills should be built without basements and slab construction employed. Also special precautions are often needed for the support of utility pipes, when they are placed in refuse-filled areas.



● **TRENCH-TYPE operation, such as this, is advantageous when hazardous materials may be brought in with the refuse.**

● **REFUSE shown here has been partially compacted prior to covering. Salvage operations on the fill should be prohibited.**

EXPRESS TOLL HIGHWAY

Needs Effective Snow and Ice Control

W. B. GETCHELL, Jr.,
Executive Director,
Maine Turnpike Authority

THE INCREASING dependence of our economy upon highway transportation has imposed a correspondingly greater burden of effort and expense in the winter maintenance of highways located in the states exposed to heavy snowfalls and subfreezing temperatures. The yearly expenditure of a quarter million dollars on the Maine Turnpike for snow removal and ice control represents nearly fifty percent of the annual cost of maintenance.

The Maine Turnpike, an express toll highway, extends from Kittery at the Maine-New Hampshire state line northerly by way of Portland and Lewiston to Augusta, the state capital, a distance of 106 miles. Two short spurs in the metropolitan area of Portland add 6 miles making a total of 112 miles of four-lane divided highway. This roadway mileage, together with 17 interchanges, 14 toll plazas and 6 restaurant and filling station service areas, constitutes the facility which poses the problem of effectual snow removal and ice control during a normal winter season of six months' duration.

Public expectation of safe, convenient and uninterrupted travel opportunity on a toll highway presents the Maine Turnpike Authority with a challenge which it has endeavored to meet with progressively increased efficiency during the past eleven years of operation.

Snowfall records of the U. S. Weather Bureau at Portland give an indication of the scope of the probabilities as expressed by historical means and extremes for the station. These are shown in Table 1.

While the mean annual snowfall for the area on a seasonal basis is about 68 inches, the accumulated seasonal snowfall during the past eleven winters has varied between 31.3 inches in 1952-53 to 116.5 inches in 1955-56.

Of equal importance, particularly in the control and elimination of ice, are the variations in temperature which prevail. The Bureau records for Portland show the expected ranges of temperature in Table 2.

As may be inferred from the tables, the four-month period, December to March, are the solid core of winter and generally constitute the big problem so far as snow removal is concerned. However, snow, sleet or ice storms during the months of November and April, and occasionally in May, cannot be ignored as potential trouble makers, and preclude moth-balling the fleet.

Table 1—Snowfall (in inches)

Month	Monthly Mean	Monthly Maximum	24-Hour Maximum
November	3.1	13.4	8.2
December	11.3	35.1	21.0
January	20.2	35.3	13.8
February	18.2	35.3	20.8
March	12.9	46.6	11.0
April	2.3	11.2	6.1
May	0.4	7.0	7.0

Table 2—Temperatures, °F.

Month	Monthly Mean	Mean Daily Low	Recorded Low
November	37.5	27.8	6
December	25.1	15.7	—(15)
January	20.7	10.6	—(21)
February	21.5	11.3	—(39)
March	31.9	21.9	—(21)
April	41.9	31.9	8
May	52.3	42.0	23

A bare pavement for safe convenient travel is considered the prime objective of the winter maintenance operations on the Turnpike. Since neither ice nor snow can be removed until it appears, and no practical preventive exists, the efficiency in achieving this objective may be measured by the time consumed in accomplishing its removal. The desirability of reducing this lapse to a minimum was recognized early in the history of the Turnpike operation by a study of the accident records during the critical period between the beginning of a storm and the final elimination of all snow and ice from the pavement areas.

These factors, then, are the principal ingredients of the problem.

Men and Equipment

To cope adequately with the task, the Authority has mobilized a considerable complement of men and equipment in its attempt to provide the best possible travel conditions during and after the 20 to 35 winter storms that comprise the seasonal frequency.

Personnel engaged in winter maintenance number 75 in the following classifications: 1 Maintenance engineer; 3 highway superintendents; 8 foremen; 53 drivers and equipment operators; 1 mechanical

superintendent; 6 mechanics and helpers; and 3 clerks.

The weekly payroll for this labor force engaged in winter maintenance averages about $6,600 with some fluctuations incident to the frequency or duration of storms. Fringe benefits, including vacation and sick leave, retirement contributions, holidays and insurance add about 17 percent to the direct payroll costs.

Fifty-nine trucks of various weights and equipped with varied body and plowing equipment are assigned to winter maintenance. This equipment is covered in Tables 3 and 4. Supplemental equipment consists of 13 tractors with front end loaders, 5 belt conveyors, a rubber-mounted crane, one grader, and a self-propelled snow loader. Collectively, this equipment represents an investment of about $575,000.

In normal plowing procedure, the 106-mile main line of the Turnpike is sub-divided into 12 sections averaging slightly less than 9 miles each. Two trucks are assigned to each section. Each truck is equipped with a hopper body for distribution of salt or abrasive. One truck is equipped with a right-hand plow and wing; the other, with left-hand plow and wing.

The 24 units engaged in main line operation are used exclusively in their assigned area with no diversionary responsibility. Interchanges, spurs, toll plazas, ramps and service areas are separate assignments requiring 25 additional units which correlate their activities with main line operations.

This total normal complement of 49 plowing units leaves 10 units in reserve for emergency use in extraordinary storms or as replacements for crippled units. All units are hydraulically controlled from the cab by the single driver-operator.

The two units assigned to each 9-mile section work conjunctively. A left-hand plow in the left-hand passing lane precedes the right-hand unit in the right-hand driving lane by about 1,500 feet. This longitudinal spacing eliminates any windrow formation between vehicles and permits over-taking traffic to weave through the plowing operation as an easy maneuver.

At each end of the 9-mile section a cross-over through the median divider strip is provided for turning to the return trip. The full cycle of 18 miles is generally completed in 1 to 1½ hours. Depending upon conditions, the second pass over the section may be identically positioned on the pavement, or the units may spread laterally to the shoulder areas which functionally removes the windrow built up on the previous pass and clears snow off of the shoulder areas.

Table 3—Trucks Used in Snow Removal and Ice Control

Number	Model & Make	Body Type	Plows
4	OSHKOSH Model 705W 154″ wheelbase	DAYBROOK dump Model B-54	ROSS interchangeable V-plow and One-Way Right. 12′ Wings, Right & Left
4	FORD Model F-600 154″ wheelbase	HERCULES dump	WAUSAU One way Right. Model B31-45W
10	FORD Model F-700 132″ wheelbase	HERCULES dump Model KD36B	WAUSAU One-Way Right. Model B31-45W
4	FORD Model F-700 144″ wheelbase	HERCULES dump Model KD36B	WAUSAU One-way Right. Model TM2-B31-45W
6	FORD Model F-900 144″ wheelbase	HERCULES dump Model 136CDBD12	WAUSAU One-way Plow & Wing, Right Model TM2-B31-45W
2	FORD Model F-900 156″ wheelbase	HERCULES dump Model KD36C	WAUSAU One-way Plow & Wing, Left Model TM3L-B31-45W
15	FORD Model F-900 156″ wheelbase	HI-WAY 9′ Spreader Model E	WAUSAU One-way Plow & Wing, Right Model TM2-B31-45W
14	FORD Model F-900 156″ wheelbase	HI-WAY 9′ Spreader Model E	WAUSAU One-way Plow & Wing, Left Model TM2-B31-45W

Table 4—Loaders and Miscellaneous Equipment

Number	Make, Type & Model
3	HOUGH Payloaders with Front End Loaders and interchangeable one-way plow. Model HH
2	HOUGH Payloader with Front End Loaders. Model HF
2	HOUGH Payloaders with Front End Loaders. Model HFC
6	FORD Tractors with Front End Loaders. Model 850
5	CONANT Belt Conveyors Model VE-4
1	GENERAL Shovel with Crane Front & Clamshell Model 105
1	CATERPILLAR Grader with V-Plow & 12′ Wing, Right. Model 112
1	ATHEY Belt Loader Model L

The width ultimately cleared on each side of the median dividing strip is 36 ft. consisting of the 24-ft. pavement, the 4-ft. inside shoulder and the 8-ft. outside shoulder. A final phase, performed after other operations are completed, is the winging back of accumulated snow beyond the 36-ft. width as preparation of storage space required for future storms. Clearing of the pavement, however, is the first priority and governs the lateral positioning of the plowing units on successive passes.

Elimination of ice and traffic-packed snow from the pavement is accomplished for the most part through direct application of clear salt (sodium chloride) at a normal rate of 500 pounds per mile for each of the two 24-ft. pavements. A single application on the entire facility requires 60 tons at an approximate cost of $1,200 on the road. Experience averages about 60 applications per year for an annual cost of about $75,000.

In practice, salt is applied from hopper bodies with spinners removed. The application is thereby concentrated in a two-foot width on the center line crown of each of the dual roadways. This concentration enhances early reaction and secures a narrow bared width of pavement which traffic automatically tracks.

Sand as an abrasive treatment is normally used on ramps with low volume traffic, at toll plaza approaches, within the service areas and at locations where traffic is required to decelerate rapidly. The sand is stock-piled in the early fall at strategic locations with about 150 pounds of salt added per cubic yard during the stock-piling operation. Sand is occasionally used on the main line when salt reaction is retarded by low temperatures. A normal application is about 5 tons per mile of four-lane pavement. Occasionally both clear salt and treated sand applications are made in periods of extreme low temperatures.

About 7,000 cu. yds. of sand are used each winter. The total annual salt requirement is about 4,000 tons. This is stored in sheds at eight locations deployed along the Turnpike.

The use of clear salt is the preferred method. The volume of materials handled is about 10 percent of that involved in the use of sand, and the application of salt can be accomplished in 1½ hours as compared with 6 to 7 hours required to sand completely the entire Turnpike. This difference in time is a period in which many accidents can occur.

Some years ago the public was disposed to criticize the use of salt because of its apparent effect upon the finish and metal parts of the car, and the subject was the basis of many "letters to the editor". Today it is seldom mentioned. The public, in Maine at least, has apparently come to realize the increased safety of the bare pavement, and a few extra wash jobs is a small premium for a lot of insurance. The simple choice lies between rusted mufflers or life and limb.

Radio Communications

Following opening of the first 46-mile section of the Turnpike between Kittery and Portland in 1947, operations were carried on for four years without benefit of radio communications. In retrospect the lack of such communications was a tremendous handicap to an efficient job of winter maintenance, but the benefits were only recognized after experiencing the use of radio in actual operations. Prior to the installation of radio communications, the plowing units and field supervisory personnel were in fact a "lost battalion." Adverse conditions remained unreported for hours and contact could only be made after miles of travel and substantial time delays. Changes in predetermined operational plans were a time consuming and cumbersome task. Radio has liberated operations from this severe handicap and the resulting efficiency is reflected in a better job in less time.

● **LOADING abrasives from a stockpile at maintenance headquarters into one of the spreader trucks. The front end loader is mounted on a Model 850 Ford tractor.**

With completion of the 66-mile second section of the Turnpike, the communications system was expanded and now consists of 37 mobile units and 25 base stations at an inventoried cost of $80,000.

In January, 1958, both State Police and Turnpike net-works were combined for control purposes under a single dispatcher at Turnpike headquarters in Portland. Since the net-works are on separate frequencies, the move was made on a provisional basis. The advantages at once appearing far offset the minor inconveniences of dual channels. The immediate interchange of intelligence between maintenance and police personnel through a central control point has been of inestimable and obvious value to both agencies, and the continued separation of police radio traffic from the maintenance and operational channel is a desirable feature. No changes are contemplated in the existing set-up.

Standard weather forecasts issued by the U. S. Weather Bureau in Portland have been a valuable tool in improving the techniques of winter maintenance. These forecasts are secured periodically as issued by the Bureau throughout the 24 hours of the day and are posted in the radio control room at headquarters. In addition, existing weather and road conditions are reported by Turnpike and Police personnel as a permanent record. This latest and "up-to-the-hour" information is immediately available at all times and is broadcast on the Turnpike system twice daily. The procedure likewise provides a prompt answer to the numerous inquiries received from the public, news media and travel agencies.

Current and forecast temperatures are important in judging the appropriate time for application of salt. Imminent sharp drops in temperatures will imply an earlier application to realize the advantages of the prevailing temperature, and to guage the rates of applications. Conversely, knowledge of an expected rise in temperature may effect an economy through a reduction in application rates.

Responsibility for accident-free travel during the winter months, however, does not devolve solely upon the travel agency charged with the maintenance of the highway. An important partner in this realm is the motorist himself who, in the final analysis, must exercise sound judgment in meeting the variety of conditions he is bound to encounter. As a general premise there are few unavoidable accidents beyond the control of the driver. As a reminder to the inattentive driver, signs are erected at frequent intervals along the Turnpike, exhorting him to "drive safely", "stay alert" and to "reduce speed on snow and ice". Motorists are cautioned, likewise, by collector personnel upon entering the Turnpike, concerning known adverse conditions. The effectiveness of such signs and advice in preventing accidents may never be known. We like to believe that it helps.

● WEATHER warning system predicts snow; a township dump truck is immediately loaded with cinders in readiness for ice control operations.

SNOW and ICE CONTROL METHODS AT THE TOWNSHIP LEVEL

WILLIAM A. SOMMERS,
Bensalem Township Manager,
Bucks County, Pennsylvania

ORGANIZING the snow and ice control program for Bensalem Township must take into consideration the road system, location and topography, and population dispersement. Bensalem Township is located on the northeastern border of Philadelphia in Bucks County. From a high promontory on its northern end the land levels to a flat marshy area at the southern boundary formed by the Delaware River. Bensalem's area is 23 square miles with 84 miles of township roads interlocked in a state system of roads of some 34 miles. These roads serve a population of 23,000 located in highly concentrated urban sections and scattered rural settlements and farms. Besides the variation in topography and the high road mileage, the rural-urban contrast is most important in snow control. While snow in the urban areas can cause a great deal of trouble in snarling traffic, it becomes critical in the rural areas where drifting snow can isolate farms and rural residences in a short while.

A brief look at the record of winter weather in this area shows that the usual winter storm deposits from 1½ to 2 ins. of snow with an average of 8 snows each winter. Most winters are relatively mild and leave little accumulation lasting through the winter. Large storms can be expected about every five years while the "catastrophic" storms are due on a 15 to 20 year cycle.

Much of the preparation for the 1958-59 season was influenced by the "once in twenty" storms which hit our area in the early months of 1958. About 18 ins. of snow came in February which was followed by another 12 to 15 ins. along with sleet and hail in the middle of March. Thousands of dollars were spent in "digging out" and homes were isolated for five or six days; utilities suffered in the second storm under the sleet and wet snow and were not completely restored until the end of the second week after the storm hit. Though the winter of 1958-59 was mild, the snow program for the township this year and in years to come will always have as its backdrop the well-remembered snow of February and March, 1958.

Weather Warning

Basic to our program is a cooperative weather warning system maintained by townships, boroughs and the state highway department in the Lower Bucks County region. Operating on pooled weather information from public and private sources, an adjoining township acts as "weather central," accumulates the information, then relays it through the police department to the townships who are members of the cooperative. The call on weather comes to our police dispatcher who, in turns, calls the road foreman, the township manager and the chairman of the Board of Supervisors. The road foreman, depending on the weather to be expected, begins to line up his work and has immediate authority to call out the crews in accordance with the nature of the weather report. Such warning gives us ample time to plan and direct the operation before we are actually engulfed.

Personnel and Equipment

Our road crew numbers ten men; three drivers and seven laborers, with a road foreman directly in charge under the authority of the township manager. The three drivers are all qualified heavy equipment operators while three of the laborers are qualified to fill in as operators. It is the responsibility of the road foreman to get the crews together and out with the proper materials and to direct changes in the snow fighting attack as the weather shifts. However, in storms of some duration the township manager works alongside the road foreman in checking routes, lining up contract equipment and handling the phone. Where necessary, township residents can and have been called in to supplement

● **OFF-SEASON, a supply of rock salt is stockpiled at the road garage and all equipment, such as these two Tarco "Scotchman" spreaders, is thoroughly overhauled.**

the crews if their relief is necessary and the three supervisors of the township have also given help.

The men are divided into three crews consisting of a driver or crew chief and two laborers. The extra man is usually given to the cinder spreading operation or detailed to the road garage for telephone duty or work on equipment changes when necessary. The road foreman has a 1950 GMC ¾-ton pick up, equipped with flashing light and rear chains. Unfortunately, we are not yet under radio control in the road department but we hope to remedy this deficiency with the construction of our new township building and the installation of central communications. In major snows and emergencies brought on by snow we work closely with the police department and their radio vehicles in directing snow removal operations.

We have three 1953 Chevrolet trucks, 103 hp with a maximum rating of 16,000 lbs. upon which are mounted 3-yd., Gar Wood dump bodies. Two trucks handle the salting operation and the other takes the cinder spreading detail. The salting trucks are equipped with Tarco "Scotchman" units. The first Tarco was purchased in the winter of 1957 and was an SS 6E with a Briggs-Stratton 2½-hp motor. The second Tarco was purchased this last season and is the lastest model, SS 7E, with a Kohler 4-hp motor which we have found to be a substantial improvement over the 6E. Both units are equipped with mounted flashing lights. We use salt in bags in our operation and each truck carries from 50 to 60 bags on its first trip. Two men operate the Tarco and break the bags directly into the hopper, using the normal setting of 300-500 lbs. per mile unless the severity of the storm warrants increased salt use. The salt is purchased in carload lots of 450 bags which is the limit of our present storage capacity although normal yearly use is about three carloads. In the 1958-59 winter we trained our crews to use a mixture of salt and calcium chloride, mixed at the hopper. Next season we plan to expand this treatment, particularly on the hilly section of the township.

The third truck is assigned to cinders which are applied by hand-shoveling from the tailgate. Sand is used as an alternative when conditions warrant and when the cinder supply runs low. Both sand and cinders are stockpiled at the road garage and during the stockpiling a liberal amount of calcium chloride is mixed in to keep the materials workable as well as to add calcium's melting action to the cinder operation. For direct loading we use a Minneapolis-Moline SS 445 industrial tractor, 57 hp, equipped with an Ottawa front end loader. The bucket has a ¾-yard capacity.

All the trucks have the flashing red light, rotating at 360 degrees, mounted on the truck cab roof.

The township is divided into three basic routes or districts with one truck and its crew assigned to each district. Two routes are salt and one is cinders. The division is based on the type of terrain, road mileage and population as well as the limitations of our equipment and manpower. Actually the routes are now too large and too isolated from control points to give maximum effectiveness, but until we are able to afford additional equipment we feel this division and organization make the best use of what we have.

The most important salt route encompasses the northern, hilly section of the township called "Trevose." This area is heavily populated, the streets have alpine inclines and in its midst is an important area station of the Reading Railroad used by commuters working in Philadelphia. With the slightest trace of slick roads and ice formation, the whole area is in trouble. The second salt route covers a less hilly terrain but one having urban concentration and only occasionally broken by rural stretches. Here are located a number of small hills at key points where traffic connects to Philadelphia and which have peak traffic loads at the rush hours. The cinder route is assigned to the most rural area where there are scatterings of residences, long rural roads and only a few hills.

Each fall before the early snows are expected the winter control map is taken out and the township manager, the road foreman and the crew chiefs sit down to plan the coming winter's program. Changes in tactics, re-assignment of areas, new methods and an inventory of snow equipment form a part of the "refresher course." Salting and cindering are done only on the hills and at crucial intersections. For with such a large area and mileage to cover with limited equipment, over extension of our program is a persistent danger. School bus routes play an important part in determining the course of our planning and assignment of priority. Because most of the school children in the township travel to and from school by bus every effort is made to see that these routes are salted or cindered first to insure their safety and easy passage.

When the crews are called into action salt and cinders are the first line of the attack and reliance on the weather warning system usually gives ample time to have the crews on the road before any appreciable accumulation has occurred. The snow fall and the type is gauged closely by the road foreman and when it appears that the fall may accumulate over two or three inches or the wind is beginning to drift the snow heavily, the trucks are

rounded up and the change is made to plows. Each truck has an assigned plow of rather ancient vintage but sufficient for the average storm which demands "pushing." The plows are connected to an under body frame and are hydraulically operated from the cab. Two of the plows are Loders and the other is a Wausau. They are 9 ft. long and 2 ft. high, curved and side angled. The angle is hand operated and must be reset as needed.

We also use a Galion 303 road grader, 67 horsepower, when it comes to plowing. The Board of Supervisors early in the fall of 1958 authorized the purchase of a grader-mounted V plow. Bids were taken and the award was given to Giles and Ransome of Philadelphia for a Balderson BV10, 1800 pounds, which is operated through the scarifier attachment of the grader. In order to make such use practical, however, additional work had to be done on the grader which was without a cab. The ceiling of the road garage can not accommodate the normal height of the grader cab and so none was required when the grader was purchased. This problem was discussed with members of our road crew and three of them set out to design and build a cab to serve our needs. Using rainy days and a few Saturdays they came up with a plywood cab, complete with spot lights, windshield wipers, heater and all the comforts of modern living! But the unique feature was their solution to the height problem. This consisted of a slip-down top which gives the cab just enough clearance to come into the road garage and when outside can be pushed to its maximum height and pinned securely to allow the operator standing room for operation. The cost in labor and materials was about one-fourth the price of a new cab.

We have also called on our front end loader for snow duty, digging out dead end streets and moving snow piles to control melting and drainage. We are presently considering the purchase of a small plow that can be interchanged with the bucket attachment and thus add one more unit to our snow force.

Supplementing our own equipment is a system of informal contractual arrangements with three local contractors for heavy equipment and operators. Our experience in the large snows of 1958 showed that any storm over 5 inches must have outside work if we are to save the rural areas from isolation and still maintain our regular traffic flow. By this method of working with private contractors, we have on reserve call three graders, two bulldozers and three front end loaders for immediate service.

Snow Fence

A system of snow fences for rural roads is necessary for a snow and ice control winter program. After November 1st the crews set out from 60 to 90 rolls of snow fence (100 feet per roll), placed where experience has taught that rapid accumulation occurs when winds accompany the storms. Pennsylvania law provides that farmers and landowners must let the township erect snow fence on their land providing it is put up after November 1st and taken down before April 1st.

● **DURING the winter, snow fence must be inspected periodically and repaired if necessary. From sixty to ninety 100-foot rolls of snow fence are set out each year.**

Another important feature of snow control that developed as a result of the storms of a year ago, is the partnership between local municipalities and the county division of the State Highway Department. In prior years the townships stuck to their own roads and the highway department did likewise. Operating on a county unit, however, the state has more road mileage than it can adequately handle when its forces are spread over the entire area. Moreover, the major routes get priority. Thus, in Bensalem, the state must necessarily concentrate on U.S. No. 1 which cuts across our northern tier and Route 13 which parallels the Delaware River on the south. But state roads which are important rural links within the township are not taken care of until the main roads are thoroughly serviced. We found, for example, that in the '58 storms our work on township roads in certain sections came to naught because connecting state roads were clogged and our residents could go nowhere. In desperation many of these roads were cleaned by township forces or contractors working for the township so that we could free our isolated residents.

Against this background the newly appointed county superintendent of highways, Oscar Booz, inaugurated a system where each municipality was asked to assume responsibility for sections of state roads within its borders which local officials felt they could manage. In return the state proposed to reimburse the municipalities for snow work on these roads at an agreed-on, uniform rental rate. Arrangements were also made to replenish from state supplies cinders, salt and other materials used in snow control on state highways.

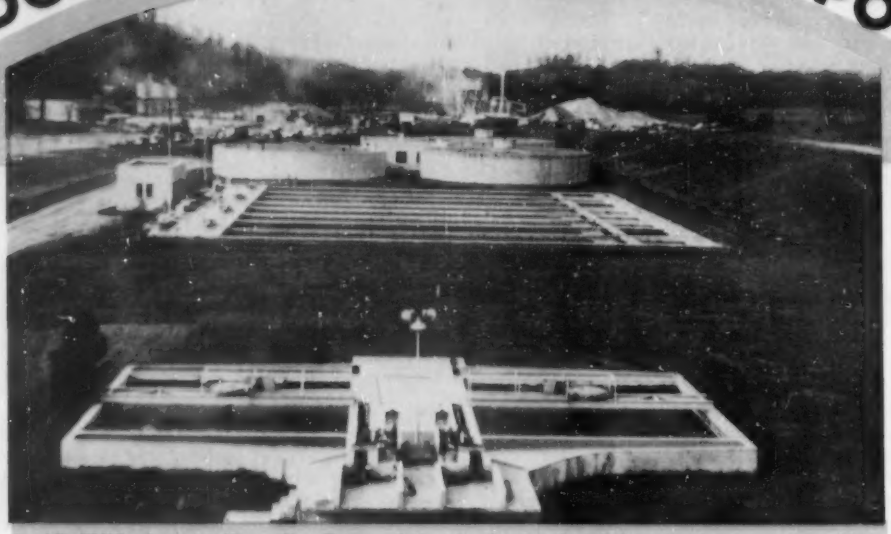
After a thorough study of our own capabilities we agreed to take over for snow and ice control purposes six miles of state roads. This worked in well with our own snow program and covers vital links in the overall township road system. A periodic report is sent to the county office of our work on these roads and subsequent payment is made from the district office in Haverford. The system has worked well in its first year and with modifications will prove to be of lasting benefit to the township and the state highway department.

Maintenance of Equipment

Prior to the winter season the snow plows are taken to a local

(*Continued on page* 176)

SLUDGE UTILIZATION AND DISPOSAL



● AT THIS plant in Knoxville, Tenn., sludge is elutriated and dewatered on a vacuum filter.

JULIAN R. FLEMING,
Director,
Division of Sanitary Engineering,
Tennessee Department of Public Health,
Nashville, Tennessee

WILL ROGERS once said "Collecting data is like collecting garbage; when you get it, you've got to do something with it." If we use the word "sludge" instead of "garbage," his point is just as good. After sewage has been separated into its water component and its solids component, something must be done with solids component. It is the intent of this article to consider in detail utilization and disposal of sewage sludge in 10 towns and cities of Tennessee.

Bolivar—This plant was put in operation about June, 1956. It was designed to serve 4500 domestic population, and to handle about 0.5 mgd dry weather flow. It is now receiving domestic waste from approximately 3000 persons, plus industrial waste from a fruit and vegetable freezer plant, which operates most of the year, but has its heaviest production during the warm season. The present loading ranges from 0.3 to 0.5 mgd normally, with occasional heavy hydraulic loading from infiltration following rains. The plant has two stages of sedimentation with a standard rate trickling filter between. Sludge from the settling tanks is pumped into a single unheated digester with fixed cover. Total usable capacity of the digester is 12,000 cubic feet, or about 2.7 cu. ft. per capita based on the design population. The digester includes a Walker motor-operated stirrer which automatically operates for 15 minutes each three hours.

During 1958 this plant discharged 6 beds of sludge to the sand drying beds, each drawn to a depth of 12 inches. Each bed has 2100 square feet, plant total 4200 sq. ft., or about 0.9 sq. ft. per capita. The usual detention period on the beds is 6 weeks to 3 months. Dried sludge is removed by hand from the beds and is stockpiled around the plant grounds, the surplus given away to anyone who will haul it off. There have been no odor problems from the drying beds, in the stockpile, or after being spread on the plant grounds.

Bristol—This plant, first operated in February, 1953, was designed to serve Bristol, Tennessee, Bristol, Virginia, and a number of industries in both cities. It has a hydraulic capacity of 6 mgd with a total population equivalent of 75,000, of which 4.5 mgd and a population equivalent of 45,000 represent the domestic design load, and 1.5 mgd with a PE of 30,000, the industrial load. At present it is serving 35,000 to 40,000 domestic population. Because of the industrial load and the small receiving stream, the plant is of complicated design, including three stages of sedimentation, and both trickling filters and activated sludge processes.

The sludge is digested in two digesters, which are operated as a two-stage unit, the primary heated to 95° F.; the secondary unheated, and operated usually between 70 and 80° F. Raw sludge as pumped to the primary digester contains an average of 93.3 percent water, and the digested sludge is between 85 and 90 percent water. The drying beds are each 25 by 75 feet. During 1958, 23 beds of sludge were drawn to a depth of 9 inches, and in addition 281 truck loads of digested sludge, estimated at 900 gallons per load, were hauled from the plant for agricultural use. The air dried sludge is used on city parks, parkways, and athletic fields. Average time on the drying beds is from 30 to 90 days in summer, and up to 6 months or more in winter. Total digester capacity is 306,000 cubic feet.

Odor problems have occurred at the Bristol plant, publicized by numerous new homes built rather close to the plant site, and downwind from it. Some of the odor may have resulted from the sludge drying beds. The digestion has been unsatisfactory for several reasons. One of these is a scum blanket that has reached a depth of 14 feet in

the primary digester. In addition, a considerable amount of bulky and non-digestible material has entered the plant from some of the industries. In addition to the slow drying properties of the digested sludge, the sand in the drying beds has an effective size that is too small, so that the drainage of water from the sludge and the collected rain on the beds is very slow.

Now only 6 years old, this modern plant has had more operating problems in connection with digestion, drying, and final disposal of sludge than any other in the state. In retrospect, it seems that chemical conditioning, vacuum filtration, and agricultural use of the sludge without digestion might have saved the Bristol plant many of the problems that it has experienced.

Elizabethton — The Elizabethton plant was placed in operation in June, 1958. It was designed to serve an immediate population of 12,000, and a 1980 population of 20,000, with no industrial waste of importance. The two very large rayon plants located in Elizabethton will provide treatment for their industrial wastes separately from the City. The sewage treatment plant includes a one-hour pre-aeration period followed by two hours of settling. Hydraulic capacity of the plant is for a 24-hour flow of about 2.0 mgd, and for a short time flow rate of 2.7 mgd. Flow data for the latter part of 1958 show 24 hour flows varying from 1.1 mgd to 1.68 mgd, with an average of about 1.3 mgd.

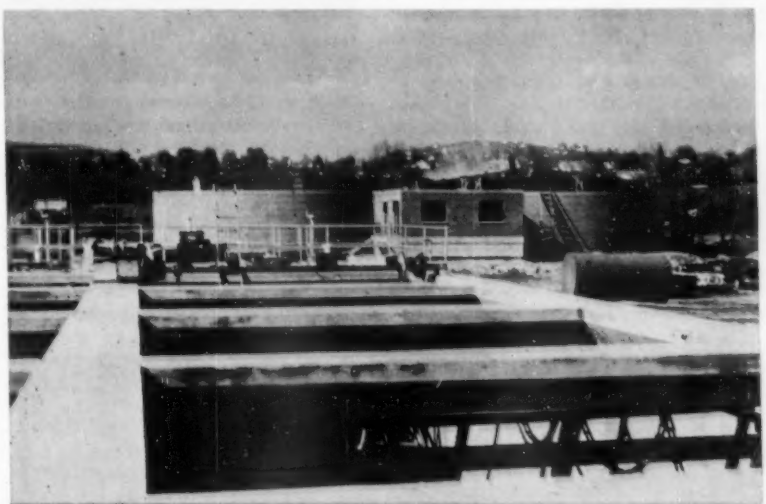
This was the second plant in Tennessee to omit sludge digestion. The raw sludge from the clarifiers goes directly to a sludge holding well, which is covered and has a plastic dome for observation use. Usually three days each week for a portion of the day the sludge from the holding well is pumped to the filter room, conditioned with lime and ferric chloride, and filtered through a Komline-Sanderson vacuum filter. From the coilfilter the sludge cake is hauled by farmers or by the City to farm land. The sludge is given away. No sale for it has been found. Normally only one day's run of sludge cake is stored in the hopper, but it has a capacity for about 2.5 days of normal filter operation.

For the first 10 months of operation, the system of sludge handling, drying, and disposal at the Elizabethton plant has been entirely satisfactory. No serious trouble of any sort has occurred; there have been no odor problems; and the cost of dewatering the sludge has decreased as the plant personnel have learned better how to condition and handle the sludge. If economical heat drying or incineration of the sludge cake could have been used here, it would seem that an almost ideal sludge cycle would be the result, but for the population served, such a refinement would have represented a major investment, and considerably higher operating cost.

Johnson City—Initial operation of the plant began about February, 1957. It is a primary type plant designed for an initial connected population of 30,000 and a 1973 connected population of 45,000. Raw sludge from the settling basin is pumped to two digesters with a combined capacity of 82,000 cu. ft., or approximately 2 cubic feet per capita. The digesters are operated in parallel, with gas heating of both. They are PFT cover units. Digester temperature has been maintained at 93 to 94° F. The digested sludge goes to drying beds, of which there are 16, 25 by 100 feet, total area 40,000 sq. ft., or about 0.85 sq. ft. per capita. Average monthly flow through the plant has been from about 2.7 mgd to as high as 5.2 mgd. The effects of infiltration in wet weather are severe. During 1958, nine beds of sludge were drawn to an average bed depth of 8.7 inches, and amounting to 16,400 gallons. Typical analyses on raw sludge show a moisture content of 98 percent, on digested sludge 89.5 percent, and on dried sludge from the beds 48 percent moisture. The normal period for air drying in summer is 15 to 20 days, and in winter 2 to 3.5 months. Final disposal of the dried sludge is as a soil conditioner on the plant grounds, for garden use on land adjacent to the plant site, by city employees for home and farm use, stock piled at the plant, and sold to anyone wishing to purchase the sludge.

Kingsport—Initial operation of the plant was in February, 1957. It was designed for an initial population of 24,000, and a 1975 population of 36,000. Because Kingsport has some very large industries which produce heavily polluted liquid wastes in considerable quantities, some but not all industrial wastes have been excluded from the city plant. The hydraulic capacity of 7 mgd with a population equivalent to 60,000 does allow for a variety of the wastes from smaller industries. For 1958, average monthly flow through the plant has ranged from 2.68 mgd to 5.35 mgd, with an average of about 4 mgd. Infiltration in wet weather causes a considerable increase in plant flow. The plant is the primary type, with two heated digesters with PFT floating covers. Digesters are kept as near 95° F. as is possible, but temperatures down to 90 for the primary and down to 80 for the secondary have occurred.

For 1958, the raw sludge contained 2.6 percent solids, and the digested sludge 12 percent solids. During the year 59,700 cubic feet of sludge were drawn to the beds and 33,800 cubic feet removed from the beds. Solids content of the dried sludge was 45 percent. Total sludge bed area is 60,400 sq. ft., with 13 beds of 4650



● AT THE Kingsport plant, most of the sludge is dried on beds, though a limited amount was spread directly on plant grounds through irrigation pipe.

sq. ft. each. During the year 17 beds were drawn to a depth of 9 inches; 1915 tons of sludge were drawn to the beds, and 512 tons were removed from them. Normal drying time in summer is about one month, in winter about 2 to 3 months. The following is quoted from the plant superintendent:

"The removal of the sludge from the beds after drying has shown that much is to be desired in finding a more satisfactory method. The use of a pick-up truck, sludge forks, and a strong back, has a serious drawback in labor cost. Most of the sludge was removed in this manner, and used after shredding for top dressing and fill on the plant property.

"About 60 pick-up truck loads of sludge were given away to anyone who would take it from the beds. A shredder was furnished, but direct shredding from the bed was prohibited. One man with a market for the sludge sold it for $6 per load until he decided the labor was too great for the money. The giving away of sludge in small amounts has a drawback since an operator is inconvenienced by having to answer questions, lending tools, moving the shredder, cleaning up the mess, etc. No effort has been made to create a demand for the sludge since the plant property could with beneficial effects absorb the sludge produced for many years.

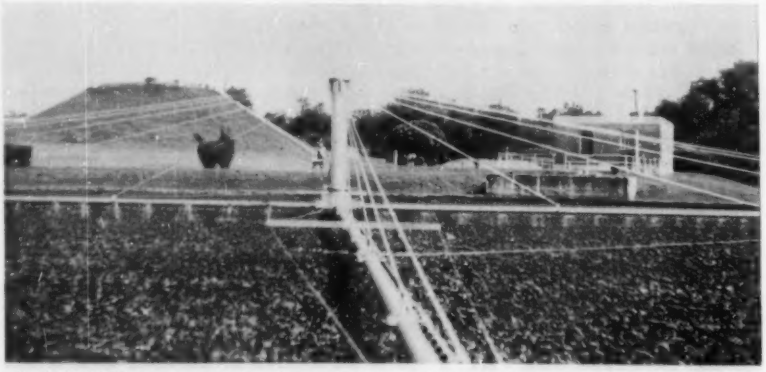
"A limited amount of sludge was applied to parts of the property direct from the digester through a four-inch irrigation pipe. Disposal in this manner seems to be an operator's dream. Labor savings in the use of the pipe more than paid for the 180 feet purchased. The thin layers applied dried rapidly with much less odor than would be created by drying on the beds. Bermuda grass thrives in it, and a very short time is required for the grass to resod during the growing season. An additional purchase of 210 feet of pipe with three available hook-up points will cover most of the usable plant property."

Knoxville Third Creek Plant—Initial operation of this plant was in October, 1955. It is a primary plant, with separate heated sludge digestion, designed for a hydraulic capacity of 36 mgd and a population equivalent of 265,000. Loading at present consists of about 125,000 domestic population, plus a considerable amount and strength of industrial waste. Average monthly flows varied during 1958 from 20 mgd to 36 mgd, indicating that there is a great deal of infiltration in wet weather. Sludge from the settling tanks is pumped to one of the two primary digesters, and from these it goes to a single secondary digester. The two primary digesters have fixed covers; only the secondary unit has a PFT floating cover. All of the digesters are gas heated to 90° or above.

Digested sludge from the secondary digester is elutriated, chemically conditioned with liquid ferric chloride and filtered through one of the Eimco vacuum filters. The plant has two filters, each 8 feet by 8 feet, and using wool cloth media. They are designed to produce a 70 percent cake at 5 pounds per hour per sq. ft. During 1957, sludge was filtered 221 days, one shift of 7.5 hours each day. During this year, total dry solids filtered was 3,304,000 pounds, with 90,600 pounds of ferric chloride dry weight being used. Average percentage of ferric chloride was 2.7, and average moisture in the sludge cake was 68 percent. The digested elutriated sludge contains from 6 to 8 percent solids. The ferric chloride is received as a 45 percent solution in 6000-gallon tank cars on the plant railroad siding. The cost is $4 per 100 pounds $FeCl_3$ content. The following is from the Plant Superintendent:

"The City of Knoxville owns and operates the McGhee-Tyson Airport located 12 miles from Knoxville. The airport has about 1200 acres of red clay land. The airport furnishes one truck and driver and the City of Knoxville treatment plant furnishes one truck for hauling the sludge to the airport. The airport furnishes all gas and oil for the trucks; this arrangement is for five days each week. On Saturday the sludge is sold at the plant site for $5 for a 3-cubic yard load. If there are no Saturday customers, the sludge is hauled to Chilhowee Park, a municipally owned and operated public park, and is used by the park on flowers, shrubs, and grass. The park is located about 5 miles from the Third Creek plant.

"During good weather we have more customers for the Saturday sludge than we can handle. Only in bad weather do we deliver to the park. It is believed that during good weather more sludge could be sold, but because of the limited space for stock piling the present arrangement seems to be best. It is hoped that in the future sludge drying by heat can be added to the plant. The dried sludge can then be sacked and stored for sale at the plant."



● **A MAJOR portion of the digested sludge of the Murfreesboro plant is hauled by tank truck for agricultural use. Solids average 7 percent; demand has been steady.**

Lebanon—First operation of the Lebanon plant was in April, 1940. It is a standard rate trickling filter plant designed to serve a population equivalent of about 8500 with a daily flow of 850,000 gallons. The present population of Lebanon is just under 10,000 and in 1950 about 250,000 gallons per day of woolen mill waste was added to the municipal sewage flow entering the plant. Raw sludge from the settling basins is pumped to a single digester, which has a fixed cover and almost flat bottom. The digester was originally heated, but in 1947 a breakdown of the heating system occurred, and it has been operated for the past 12 years unheated. In 19 years of operation, the digester has not been cleaned out.

Digested sludge goes to open drying beds, of which there are three, each 26 by 73 feet, with a total bed area of 5,694 sq. ft. This is probably less than 0.5 sq. ft. per capita based on the 1959 plant loading. Hydraulic loading on the plant at present varies from about 0.9 to 1.0 mgd dry weather flow to 1.4 mgd, which is the hydraulic capacity and bypass loading of the plant. The sludge is

(*Continued on page* 202)

NEW ERA OPENS for Roadside Parks

● ROADSIDE park located on State Route 17 in Nevada between Virginia City and Reno offers this magnificent view to motorists who stop for a rest.

JACK M. WERTS,
Formerly Director of Public Information, Kansas Highway Department

IT IS REFRESHING to take a break during a long drive on the road; and the attractive roadside park is a handy place to stop. In virtually every state of the nation these inviting, sheltered rest areas have been developed along major highways. Driver and passenger may take time out for a few minutes of exercise, a picnic lunch or perhaps a brief nap before the trip is resumed.

In most cases the roadside park is one which has been built and is maintained by the state highway department. More than 40 states have highway department programs which have brought about development of individual turnout park systems. On the average, each of these states has between 100 and 200 parks, and has a construction schedule that calls for perhaps a dozen additional ones to be built each year. In some states both state and federal park authorities have done the development, using natural mountain or forest features which were readily adaptable to roadside rest area buildup. From these efforts an attractive and convenient system of parks has grown up coast to coast, and from Canada to the Gulf.

Many states term their park areas "good will ambassadors"; and indeed they must be recognized as such, with an estimated 30 million persons taking advantage of their services each year. Heaviest use is, of course, through the summer months; but there is year-around patronage in the more highly developed areas. The state of Virginia, in which roadside parks have received serious attention for nearly 30 years, estimates more than a million visitors use its "wayside areas" each year. This state, with only 44 parks, has fewer than the average number. Kansas, also one of the leaders in the program, has approximately 150 rest areas. Its first one was built in 1934 on a two-acre wooded tract on US 50 in the eastern part of the state. Georgia has 158 turnout rest parks completed and 29 others in various stages of construction. Illinois totals 360 roadside units, of which 243 provide away-from-the highway parking and 117 are shoulder-parking picnic table spots.

Generally recognized as one of the foremost states in the development of roadside parks is Ohio, which is conducting research on the best type of facilities for year-around use. Wilbur J. Garmhausen, chief landscape architect for the Ohio Department of Highways, says the state hopes to develop all-weather water flush toilets for its installations soon. At the present time investigation is being made of the possibility of using electric coils around plumbing to prevent freezing. However, for slightly more money the entire building which houses rest room facilities can be heated. This method probably will be the one followed. Ohio plans also to install freeze-proof fountains, with the water supply pumped from wells. Other areas with freezing weather problems are watching with great interest the research going on in the Buckeye State.

Several southern states have been able to use flush type facilities in their roadside restrooms for a number of years. Going all out in the program several years ago was North Carolina, where standards of water supply and rest room facilities have been raised steadily. F. H. Brant, landscape engineer there, says the highway department is ready to meet newer and higher

● BY MAKING full use of pleasant natural surroundings, this park near Stafford, Virginia, provides a wading pool as well as picnic facilities for highway travelers.

● **DURABLE picnic tables and benches plus plenty of litter cans keep down the maintenance costs at the wayside rest area off U.S. Route 1 near Carnestown, Fla.**

standards which are sure to come about as the result of new Interstate Highway System construction. Where his state and most others have built their parks for $2,500 to $10,000 in the past, Brant says serious consideration is being given to $20,000 installations in the future.

Average Costs

Up to now costs for parks in the various states have differed considerably. South Carolina, for example, reports wayside areas in that state run about $500 each, an amount given also by Montana. Oregon roadside rest areas cost about $2,800, which is the average in most states. Higher costs are found in New Jersey, where the price for each has been about $20,000; Kansas ($6,000 to $8,000); Michigan ($8,000 to $12,000); North Carolina ($6,000 to $10,000) and Kentucky ($10,000). Much of the cost depends upon terrain, the number of growing shrubs and trees and other natural surroundings. Mountainous and wooded states in general report a lower cost for building. Shelter, good shade and natural beauty exist in them to make the job easier from the outset.

The men responsible for the parks in each state consider the money for them well spent. Aside from the public relations standpoint, there is another very important factor which in itself justifies expenditures. This is the factor of safety. A well rested driver is a safer driver. Passengers are happier after a breather. This applies especially to children who are given an opportunity to enjoy a few minutes of freedom from the confines of the family automobile. They will be more contented passengers and less likely to distract the man or woman at the wheel once the trip is resumed.

The park building program has made remarkable progress in the past 20 years; and a new era with parks of more elaborate dimensions appears to be at hand. The new 41,000 mile Interstate Highway System is being built to meet traffic demands; and considerable progress has been made since the 1956 Federal Aid Highway Act made its beginning possible. Four - lane sweeps of concrete and bituminous surface are showing themselves in every state, with opposing lanes separated by grass covered median strips from 36 to more than 60 feet in width. Once this system is completed, early in the 1970's automobiles and trucks will go farther in a day and will do it more easily. There will be the real temptation for drivers to stay on the highway too long during the driving day. It will be more important than ever to make sure they have adequate opportunity to take brief rest periods and maintain the alertness they should have for safe driving.

As a result, in national and regional state highway conferences, highway planners have taken a realistic look at demands which are certain to be made on them soon. At the American Association of State Highway Officials convention in San Francisco in December, and at the Mississippi Valley Conference of State Highway Departments in Chicago in March, the subject was one which came in for much discussion.

The Interstate System

It has been agreed generally that the Interstate System will call for roadside parks of considerably higher than average type, with improved water and rest room facilities, generally deluxe improvements approaching those which have been standard on the nation's turnpikes. In fact, turnpike restaurant, service station and companion rest area fixtures already have been incorporated into the Interstate System in several states. The federal government has allowed Interstate routes to follow existing turnpike routes where this can be done, to eliminate the necessity of building high standard freeways which will parallel these trafficways already in use.

It is certain that more plumbing and generally higher type construction will be required in roadside parks in the future. With highway departments keeping in close touch, it is likely standards will be fairly uniform throughout the United States. General agreement has been reached that parks should exist about every 30 miles along heaviest traveled highways.

In most cases, this will mean a pair of parks every 30 miles—one on either side of the divided high-

● **DRIVERS of heavy trucks, as well as motorists, find this Missouri roadside park to their liking. The site is six miles west of Springfield, Missouri off U.S. Rt. 60.**

● **ON THE INTERSTATE system, it is anticipated that a roadside rest area will be placed on each side of the highway at about 30-mile intervals. More elaborate service areas such as this one on Interstate No. 70 in Kansas serves both lanes.**

way. The pattern will be staggered so the park on the right will come into view before the one on the left which will not be accessible to traffic in the right lane. In a few cases, states contemplate such rest areas between the lanes.

With a proposed Interstate system of 41,000 miles, a park on either side every 30 miles will require an additional 2500 roadside rest areas. Roadside parks on the Interstate System are expected to cost an average $20,000 each. Much more attention will be given to picking sites where water will be available for proper plumbing fixtures, to provide larger parking areas and for fencing. The average size will be about the same, one to five acres, and maintenance costs should then be about the same as present averages.

Maintenance

Maintenance for a roadside park costing $5,000 to $10,000 runs about $800 per year in Kansas, which is probably an average figure for all states. There appears to be no direct relationship between building costs and maintenance costs. Maintenance consists mainly of mowing and cleanup, so the size of the area is the major determining factor.

The site for a roadside park is usually located in a cool, shady place, with an abundance of tall trees and green grass. Much attention is given to maintaining the sites to keep them attractive and inviting. The average park has a shelter house, two or more durable picnic tables and benches, a drinking fountain, an incinerator, a fireplace and perhaps a grill or two, outside toilets (more and more of them becoming modern with running water piped in) and refuse barrels. Landscape plantings are accomplished if natural surroundings are not adequate.

The federal government participates in payment for the parks. On the Interstate System 90 percent federal and 10 percent state funds are used at sites accepted by the U. S. Bureau of Public Roads.

Following present plans, most states will be working to maintain their position in the roadside park improvement program. New areas are under constant study as possibilities. Pride is taken in keeping existing installations neat and clean through constant attention. The park areas serving at the present time are expected to remain inviting and pleasant guest spots for many years to come. New ones will provide added enjoyment for the ever increasing number of travelers on the nation's highways.

In Water Plants . . .
HOW SMALL IS SMALL?

V. A. VASEEN,
President
Ripple and Howe, Inc.,
Denver, Colorado

THE HAZELTINE Heights Water District, is a quasi-municipality, organized under Colorado statutes, consisting at its organization of 60 building sites and one 2½-acre commercial site. It is located in suburban northeast Denver. The area was started in 1953 as a development known as Hazeltine Heights Subdivision. In July, 1955, Mrs. Gertrude Seyler and Miss Marian Richardson, the land developers, commissioned an engineering report for water and sanitation, which indicated the cost of sanitation improvements would be $31,400 and water improvements, $32,500. The combined figures exceeded the total assessed value of the proposed district by approximately two times and consequently the projects were not feasible. It was suggested by the consulting engineers that the land developers try to install these facilities on either a "mutual" basis, a "public utility" basis by means of an outright subdivider grant to the buyers, or by the formation of a water and sanitation district. Several bonding houses were introduced to the problem and all rejected the area as infeasible, even though the potential in regard to location was of interest to all concerned.

The Adams County Assessor advised the property owners comprising a Citizens Committee that the proposed district area had an assessed value of $57,050. In reviewing this information, the engineers proposed that approximately one block be provided with water facilities. This area had an assessed valuation of about $40,000. Accordingly it was decided to organize it as a water district. The engineering estimates on the necessary work amounted to $24,500, this including about 3,000 ft. of 4-in. cast iron pipe for $11,100; valves and fittings, $1,140; pumps and hydropneumatic system, based on a shallow well installation, $4,500; automatic chlorination and housing of facilities, $4,500; contingencies, legal and engineering, $3,260.

Various public meetings were then held and petitions for the formation of a water district circulated. This led to an election, in which 20 voters unanimously approved the move. The organizational meeting of the district was held in June, 1958, at which board members were elected.

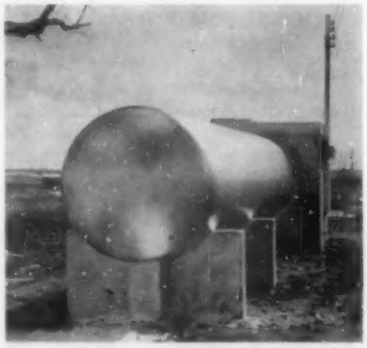
The first action of the board was to authorize their attorney to prepare a resolution and set an election date for $35,000 in bonds ($25,000 for immediate use and $10,000

● **PUMP house interior with well shown at lower right corner. Submersible pump is used with pressure control feeding to hydropneumatic tank shown at right below.**

for future use) to raise the money to construct the proposed water system. At this meeting the engineer was also authorized to prepare factual information on the proposed water bond issue to be presented in question and answer form to all of the taxpaying electors within the district. The electors were told in the question and answer sheet that a levy would be required of about 30 mills for 1959 and 20 mills in the next few years, gradually dropping 3 mills per year. Even with this almost unheard of advice in regard to mill levy, the voters approved the bond issue by 15 to 6.

The Board of Directors authorized the engineers to prepare final plans and specifications and receive bids for the installation of one 750-ft. deep well; one pump and chlorination house with chlorinator; and about 3,200 ft. of 4-in. cast iron pipe. Bids were subsequently received and evaluated, with the Oliver Well Works of Greeley, Colorado, being low bidder in the amount of $16,927. The bidder's proposal called for the installation of a Peerless submersible pump to be set in an Arapahoe Sands well, with the pump and motor to be controlled by a magnetic cross-the-line starter and switch. It was proposed that the well pump, to be controlled by a pressure switch, be a Mercoid type with a pressure range of zero to 100 pounds and a minimum differential of 3¾ pounds.

The drop pipe in the well from the surface to 450 feet was to be 2-in. standard galvanized pipe; the pump house to be constructed of cinder block with insulated roof; the chlorinator, a Wallace and Tiernan hypochlorinator; and the hydropneumatic tank to have a capacity of 3,778 gallons. The contractor was notified to proceed in December, 1958, and he completed the project in March, 1959.

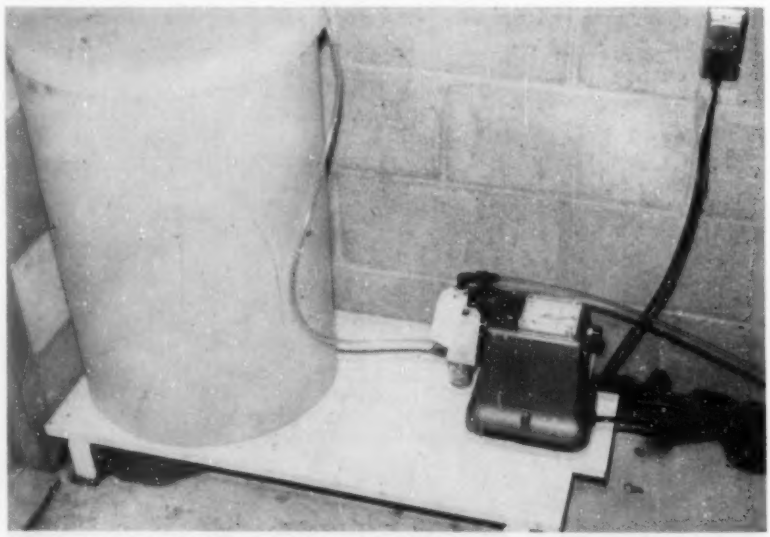


● **PRESSURE tank has a capacity of 3,778 gallons, providing a maximum pressure of 100 psi, with small variation.**

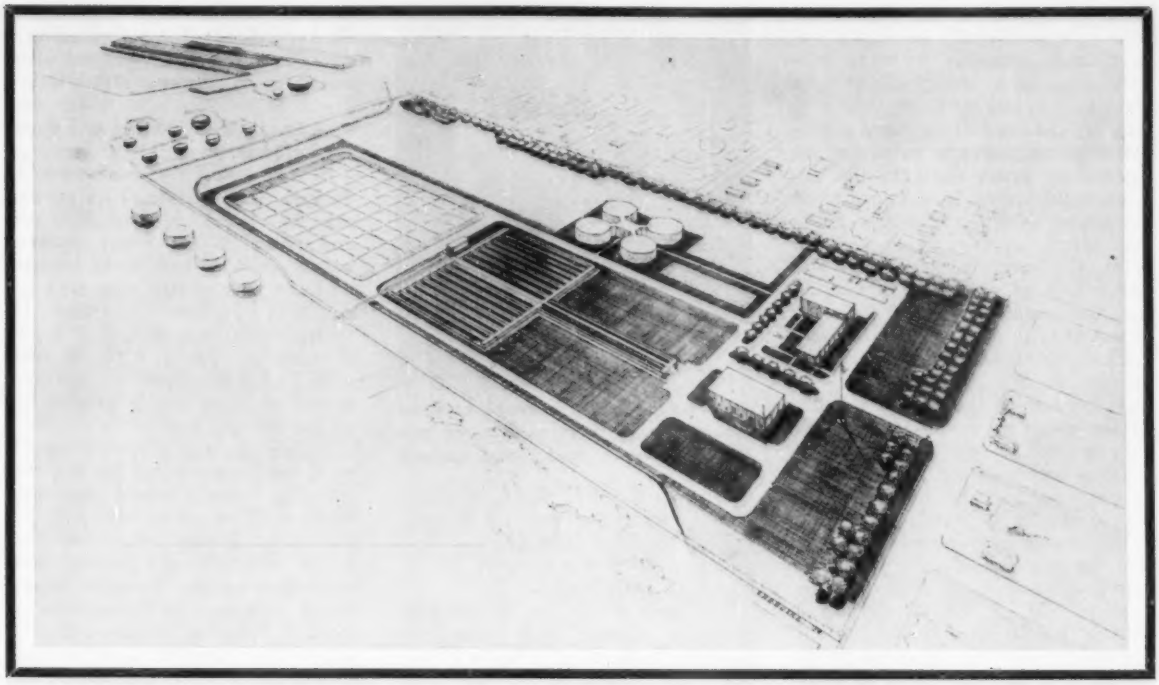
It was originally hoped by the Board of Directors that by September, 1959, the District would have 10 water users on the system. But in April, 1959, there were 11 water users and 13 paid applications for taps in the system, thus insuring that by a doubling of the assessed value, the district could very probably reduce the mill levy by at least one-half.

The district established water rates, having winter rates from October through April at $7.00 per month; and summer rates from May through September at $9.00 per month. There is an advance deposit of $10.00 with the application for service, as well as $7.00 in advance for the first month's water service. A $5.00 inspection fee is charged on each tap at the time the installation is made, with tap fees of $150 through April 1, 1959, at which time the tap fee was increased to $250. The original offer of a tap fee of $150 was an incentive to all of the existing residences in the district to be connected to the system.

The Board of Directors and the taxpaying electors who had the foresight and fortitude to ask for a tax increase of 24 mills are to be commended and it is a pleasure to see the work of this industrious group bear fruit in the rapid growth in this area.



● **HYPOCHLORINATOR installation is located in corner of pump building to treat water as it is taken from 750-ft. deep well which reaches into Arapahoe formation.**



● ARTIST'S drawing of the proposed sewage treatment plant. Ultimate capacity will be 70 mgd, but initial capacity less.

TRUNK SEWER PROJECT Starts a $100 Million Program

C. E. WRIGHT

A FIFTEEN million dollar sewer project is under way in Jacksonville, Fla., the initial phase of an overall, long-range program to cost ultimately about $100 million in accordance with a master plan prepared in 1955 by Metcalf & Eddy, Boston, in association with Reynolds, Smith & Hills, Jacksonville. The current project, designed by these two engineering firms, is under the supervision of City Commissioner Louis H. Ritter and City Engineer Bill Bryant.

The master plan did not call for a sewage treatment plant in the near future, although ultimate treatment was anticipated. However, the Bureau of Sanitary Engineering of the State Department of Health would not approve sewer construction unless treatment was included. The treatment plant has been designed for an ultimate capacity of 70 mgd, with about a quarter of that capacity to be built at first, with future additions as required.

In this initial program, trunk sewer lines, with pipe diameters ranging from 18 to 84-in., will serve the northwestern section of the city that is not now sewered. The smaller diameters, 18 to 24-in., will be vitrified clay, and the larger diameters, 30 to 84-in., will be reinforced concrete.

All concrete pipe will be covered with an interior coat of epoxy resin as a protection against hydrogen sulfide gas which may be expected during the first few years of sewer life due to low flows. Although epoxy resin has been used by some engineers in sewer work, this is the first time it has been specified on a sewer job by Metcalf & Eddy. "We were not sure we would have a hydrogen sulfide gas problem in Jacksonville," one of the firm's engineers said, "but we decided to take this precaution."

● ALL pipe surfaces are carefully cleaned before application of coating.

The coating being used, tradenamed Phenitrol 90S, as developed by the Corrosion Control Co. of New York, may be brushed or sprayed on in coats 4 to 15 mils thick, dry film thickness, or it may be troweled in any desired thickness. One coat of primer followed by two topcoats of Phenitrol will give a dry film thickness of 12 mils. This thickness shall be built up in two coats, color to be specified by the engineer.

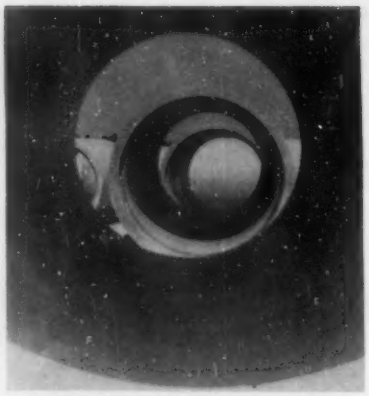
The engineers have specified that, after all surfaces have been thoroughly cleaned, the coatings

shall be applied to the pipe at the site of manufacture. Manholes and any other concrete or brick surfaces exposed to sewage atmosphere are to be similarly coated. Any damage incurred in handling, transportation or storage must be repaired by brush coats to the required thickness. Pipe joints must be sealed with a sufficiently flexible plastic compound, compatible with the coating employed. The joints will be made from the inside and the coating applied to them by brush to form a continuous surface.

The coating and catalyst are delivered to the job-site ready for use. Because of the limited pot-life of the catalyzed material, no more is prepared at one time than can be used before curing. Spray equipment must also be handled with this condition in mind.

Exhaustive tests have been specified by the consultants, including immersion in 5 percent sulfuric acid at 100° F for 60 days and 140° F for 60 days, immersion in 5 percent sodium hydroxide at 100° F for 60 days and immersion in boiling water for 60 days. Additional tests with thickness gauges, sample strips, etc., during application are ordered to insure uniform quality.

The treatment plant, which with the main pumping station will cost about $3 million, or about a fifth of the entire current project, will consist of aerated grit chambers, primary settling tanks and chlorination. Sludge will be digested and then dewatered on open sludge drying beds. After removal of all settleable solids, the chlorinated effluent will be discharged into the St. Johns River. The outfall will



● **EPOXY coating material used on the interior of these pipes cures rapidly to form a hard, inert surface.**

extend to a water depth of about 25 ft., where the current is swift enough to effect rapid dilution as it sweeps toward the Atlantic Ocean, about 15 miles away.

The main trunk line of the new sewerage system will have two pumping stations. A tributary station will discharge sewage into another trunk sewer. Pipe is being laid at a maximum depth of 18 to 20 ft. between stations.

Much of the area to be served by the new system consists of newly developed subdivisions, which are now using septic tanks, a practice that is being frowned upon by the State Department of Health in built-up urban areas.

Financing

Financing of the sewer system expansion was obtained through a $30 million bond issue, sold early last year, the remainder of the proceeds being used for various other civic purposes, including a new $5 million city hall now under construction, a sports arena to cost about $3 million, also under construction, and for paving and drainage projects.

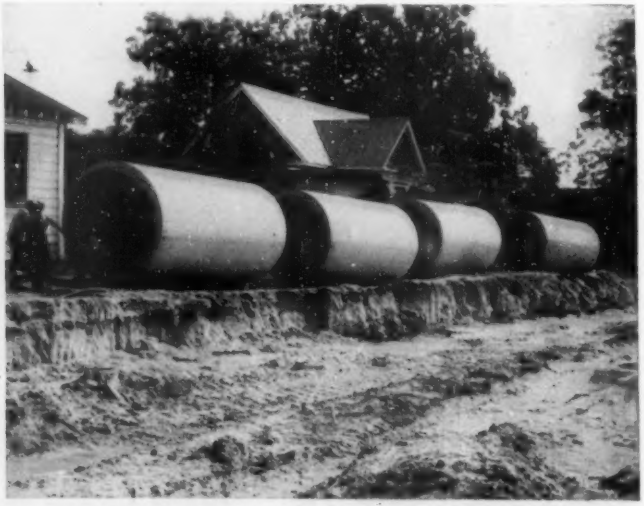
If a proposal for annexation by Jacksonville of some of its growing suburbs should go through, a second phase of the sewer program would probably have to be initiated within a year or two after such annexation. Jacksonville civic interests have been fostering a plan to take in several outlying areas with a total population of 147,000 or almost as many people as now live within the city limits.

Legislation was proposed whereby a joint referendum by city and suburban voters would determine whether all would be taken in. But the Duval County legislative delegation declined to sponsor such legislation at the biennial session which convened in Tallahassee on April 7. There is already a law by which each suburban area can vote on whether it wants annexation, and apparently that is the way the question will have to be decided.

If all of the proposed territory were taken into the city, the Jacksonville population in the 1960 census would be around 350,000, which would restore the city as the largest in the state—a position it has lost to Miami, which is now first, with Tampa, which annexed some of its suburbs, in second place.

A sweeping annexation in Jacksonville would require large expenditures for sewers, water, highways, street lighting, police and fire protection and other services.

● **SPECIFICATIONS required that the pipe manufacturer must also apply interior coating material.**



● **AT THE JOB site, coating was inspected and any damage that had occurred was repaired by brush coats of the required thickness.**

TRACTOR USED ON LANDFILL DOUBLES FOR OTHER CITY WORK

JOHN H. KENNAUGH,
City Manager,
Buchanan, Michigan

COLLECTION and disposal of wastes cost Buchanan, Mich., less than $23,000 a year, or 7.7 percent of the budget for this amount. We service approximately 6,100 persons representing 1660 homes, more than 160 businesses, 6 restaurants and 5 grocery stores. The collection service has a budget of $19,000 and the sanitary landfill budget is $4,000.

A feature of the landfill operation is our use of a rubber-tired tractor. In October, 1956, we purchased a Michigan Model 75A tractor shovel. The unit was equipped with Hard Rock tires for added protection in the landfill area. The tires are 13.00 x 74 eight-ply manufactured by the Goodyear Company. Except for a spare tire that was originally purchased with the unit, we have not purchased any replacements during the two-year period. We do not anticipate the need of a tire replacement for at least one more year.

During the past two years we have serviced nine flat tires caused by one spike puncture, two rim cuts and six tube stem fractures. The average time to repair a tire is two hours for one man. We have not experienced excessive tire cutting because of our method of levelling and covering the waste material prior to compaction. The tires have incurred some chipping and approximately 50 percent wear on the tread; however, we expect at least one more year life on all the tires.

A principal reason for purchasing the rubber tired unit was its ability to work on different jobs. It is not unusual for the tractor-shovel to be used on several projects during the course of a day, including: Loading and unloading material for trucks on water, sewer and street construction; removing logs and stumps; snow removal; picking up wet leaves, loading sand and salt for ice control; and general excavation and rough grading. During 1958, 43 percent of the machine time was spent on the landfill, 40 percent on street maintenance, 9 percent on water work and 8 percent on miscellaneous projects. Total work time was 1,985 hours, or 76 percent of an average 50-hour week. The cost of operation was $1,613.68. This included $547.38 for gasoline; $52.20 for oil and grease; $682.10 for parts; and $332.00 for maintenance. In addition were overhead, insurance and depreciation costs.

The landfill area is located in a swamp area that is surrounded by wooded hills that have a very sandy soil. A fill strip 24 to 30 feet in width is created by dumping and this is levelled and covered by the loader with the sandy soil from the adjoining hills. As the waste material is levelled, the sandy soil is spread on the fill strip by the loader bucket to protect the tires. This method also prevents the collection of wastes in the wheels and the bucket which would create undesirable odors on the unit when it operates in the city. As each strip is constructed it is used as a runway for the trucks to compact the covered wastes.

Throughout the year a weekly waste collection is provided on Friday. In the residential area this collection is made at the street curb. Four dump trucks are available for this collection. The summer garbage collection is made twice a week at each residence, with pick-ups at the rear of each building. A 13-cubic yard Leach packer and a three man crew are used for this collection. During the winter months this service is limited to once per week. Restaurants and grocery stores are provided five collections a week for garbage and waste.

An extra waste collection service is provided to the residential areas in the spring and fall. Each spring the Chamber of Commerce sponsors a two-week program to encourage Clean Up—Fix Up—Paint Up—Plant Up. The City cooperates in this program by providing a daily trash collection to encourage the elimination of five hazards and beautification of our community. A similar program for one week is arranged in the fall during fire prevention week.

● **CLEARING** brush and undergrowth from adjacent areas needed for extension of landfill is handled efficiently.

● **LANDFILL** area is made in two layers, with garbage as a base course and refuse, as shown here, for a cover.

● RATH PARK, as seen from the air. The new pool group is at center, parking lot in foreground and ball fields beyond.

THREE NEW POOLS COMPLETE 13-ACRE PARK DEVELOPMENT

A 13-ACRE TRACT of land that was formerly a swamp has been developed into a family recreational area to serve residents of Franklin Square, an unincorporated village in Nassau County, Long Island, New York. Within the park there are three pools, three ballfields, basketball and handball courts, horseshoe pits, game tables, kindergarten playground and a 268-car parking area. Known as Rath Park, this new facility of the Franklin Square Park District will be operated by the Town of Hempstead's Park Department. Because of its location in the heart of this suburban community, Rath Park is no more than 10 minutes away from any of the 10,000 Franklin Square families.

Pool Construction

The central feature of the development is a swimming pool group designed to accommodate up to 1,500 people at a time. The three pools in the group separate divers, swimmers and waders for both safety and convenience.

Largest of the three is the main swimming pool, which was designed to meet regulation Olympic standards for a 50-meter pool. This requires its length to be about 165 feet; it is 90 feet wide and the depth varies from 3¼ feet to 5 feet. It has a capacity of 434,105 gallons. Reinforced concrete was used for construction, with Calrock as an additive to the mix. The floor is 8 ins. thick and is supported by concrete beams and columns on spread footings spaced 18 ft. 3 ins. along the length and 15 ft. across the width. Parallel score marks 10 ins. apart were cut into the floor on 7-ft. centers to outline the racing strips. Expansion joints were placed across the width at one-third points and along the length at the center.

The 36 drains in the scum gutters are evenly spaced around the periphery of the pool and 30 injectors were installed between the drainage points. Four vacuum fittings were provided for cleaning purposes. Water is recirculated through the pool drain into an 8-in. pipe. A check valve is installed to allow separate draining of the swimming pool and the diving pool if desired.

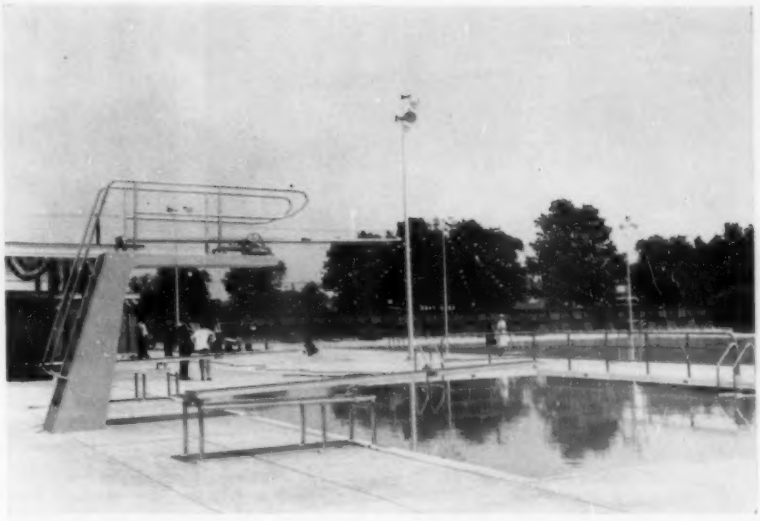
Like the swimming pool, the div-

● LARGEST of the three pools at Rath Park is devoted to swimming. Built to Olympic standards for a 50-meter pool, it is 90 feet wide and from 3½ to 5 ft. in depth.

ing pool is built of reinforced concrete. This pool is 50 ft. by 35 ft. in size and varies in depth from 4 feet to 11½ feet. Capacity is 121,106 gallons. The 10-in. floor of the pool has stiffener beams on 10-ft. centers lengthwise and 17½-ft. centers across the width. Water recirculation is handled by 14 scum gutter drains and 10 injectors. Main features of this pool are two one-meter diving boards and one three-meter board, mounted on a reinforced concrete stand. The aluminum diving boards were supplied by American Playground Device Company.

Separated from the main swimming area there is a children's wading pool which is 20 feet by 40 feet in size and from 6 ins. to 18 ins. deep. Water enters this pool through two fountain-like sprays at the shallow end and is recirculated through a pool drain and two overflows.

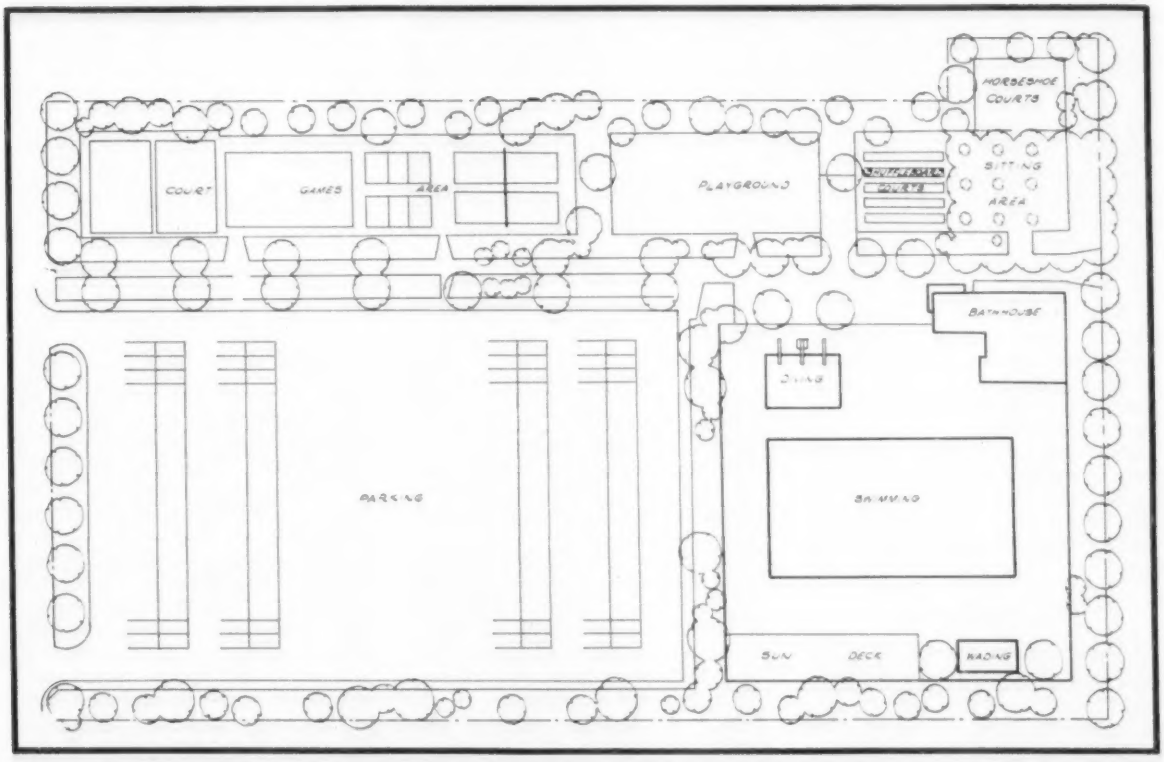
All three pools are surrounded by a wide concrete terrace to provide maximum safety for users. At one corner of the area there is a four-level concrete sun deck for sun bathing and lounging. In addition there are locker, shower and first aid facilities in a bathhouse-administration building, an easily maintained brick and tile structure which provides dressing and checking space for 300 or more patrons. The entrance loggia serves the extra purpose of a shady retreat on excessively sunny days.



● **AT THE diving pool, the 3-meter board is supported by a reinforced concrete platform, which is flanked by a pair of 1-meter boards. Maximum depth is 11½ feet.**

Pool Area

The pool area, which measures 230 feet square, is enclosed on three sides by a 7-ft. redwood fence built up of panels set in a diagonal pattern. The fourth side, which contains the entrance to the pool area, has a chain link fence. Entrance to the pool area is through a turnstile, foot controlled by the cashier. Exit is through another turnstile to enable calculation of the number of people in the pool area at any one time. Approximately 700 people can be in the water at once, and the wide terraces and sun deck provide room for an additional 800 persons.



● **IN ADDITION to the pool group there is a large game and play area. Only the pools require an admission ticket.**

● WADING pool is well separated from other activities. Recirculation changes the wading pool water every two hours.

● TERRACED sun deck is built in four sloped treads, a design which adds to the comfort of sun bathing and lounging.

Water Purification

Volume of the three pools totals nearly 600,000 gallons. This is continuously recirculated through a pressure filter system consisting of three Hungerford and Terry 8-ft. by 20-ft. filters containing Anthrafilt filter media. Water in the swimming and diving pools is recirculated every eight hours; in the wading pool the water is completely changed every two hours. The entire system is operated on a 24-hour basis by a 1250-gpm centrifugal pump driven by a 25-hp motor.

Following filtration, the water is chlorinated. As in other pools under the jurisdiction of the Town of Hempstead, the high free residual method is used. Free chlorine residual is maintained between 1.5 and 4.0 mg/L. To minimize the possibility of eye irritation, the pH is maintained between 8.2 and 8.8. A Wallace & Tiernan 400-lb. per day chlorinator with a five-cylinder manifold provides capacity for large dosage during critical bathing load periods. Caustic soda, 50 percent, for pH adjustment is fed as a solution by a Wallace & Tiernan diaphragm solution pump with a 200 gallon per day capacity. Aluminum sulphate, technical grade, is used as a coagulant. This is fed by a Wallace & Tiernan dry feeder.

Both chlorine residuals and pH determinations are taken hourly and are recorded in a log book together with water and air temperature, bathing load and other pertinent data.

The Park Area

Adjacent to the pool group there is a paved parking field for 264 cars, with a bicycle parking area at one end. Across from the pools and parking lot is a play area which includes five shuffleboard courts, three horseshoe pits, a tree-shaded sitting area with permanent tables for chess and checker players, a fully equipped playground for youngsters, four handball courts, two badminton courts and three basketball courts. The entire area is enclosed with aluminum chain link fences. The northern part of the park, which was previously developed, is devoted to softball and baseball. Three diamonds occupy this section.

Within the swimming area, lighting is provided by 25 Westinghouse incandescent floodlights mounted on 11 aluminum standards. The parking field is lighted by incandescent luminaires and floodlights mounted on 15 davit type aluminum standards. Both the floodlight poles and davits were supplied by Pfaff and Kendall.

Park Finances

Total cost of construction for the swimming facilities at Rath Park reached nearly $600,000, of which approximately two-thirds were expended for the swimming pool and site development and the balance for the bathhouse. Insofar as possible, finances are designed to be on a self-sustaining basis with membership payments to cover operating, maintenance and construction costs of the pool area. For 1959 the membership fees were set at $35 for a family and $15 for an individual. The remainder of the park area is maintained on the tax rate assessed by the Park District.

The design and layout of Rath Park was directly supervised by Arnold Vollmer, senior partner of Barstow, Mulligan and Vollmer, consulting engineers of New York City. J. T. Metz was resident engineer for the consultants. G. S. McMullan, Deputy Director of Parks, represented the Town of Hempstead. In drawing up plans for the park, the consultants aimed at complementing rather than substituting for the Town, County and State parks now readily available to the community. Plans were started in late 1957; the ground was broken October 21, 1958, and the pool group was officially dedicated on June 6, 1959. General Contractor for the construction was Auserehl and Sons of Jamaica and Freeport, N. Y.

Operations of the Town of Hempstead are under the direction of Presiding Supervisor Edward P. Larkin. The Park Department, which is responsible for developing, operating and maintaining eight Special Park Districts plus ocean beaches, a marina, and public pools, parks and playgrounds, is headed by Thomas V. Kelly, Director of Parks. The editors wish to express their appreciation to George J. McVey, Executive Assistant to the Supervisor, who supplied much of the material for this article.

● ● ●

Use of Foreign Materials in Federal-Aid Highway Work

Use of foreign materials in Federal-aid highway work may be restricted by state highway departments provided the restrictions do not exceed those now applied to Federal construction, according to a memorandum from Federal Highway Administrator Bertram D. Tallamy. A 1954 Executive Order implementing the Buy American Act of 1933 permits the use of foreign materials in general, if a saving of at least 6 percent can thus be realized. The Tallamy memorandum, which applies only to highway departments that impose restrictions on the use of foreign materials, lists administrative procedures that must be followed to avoid projects involved.

CONTROL OF Canning Waste Oxidation Ponds

N. E. DAVIS,
Chief Engineer,
Field Investigations Section,
Division of Water Pollution Control,
Texas State Department of Health

THE LOWER Rio Grande Valley of Texas has been faced with the problem of treatment or disposition of cannery waste, principally from citrus fruit, since the early 1930's. Before the heavy freeze of 1950 the volume of cannery waste produced at Weslaco, a town of about 7,000 at that time, was approximately one million gallons per day, exceeding the domestic waste. Initially, the sanitary sewer system was used for disposal, invariably upsetting the sewage treatment plant.

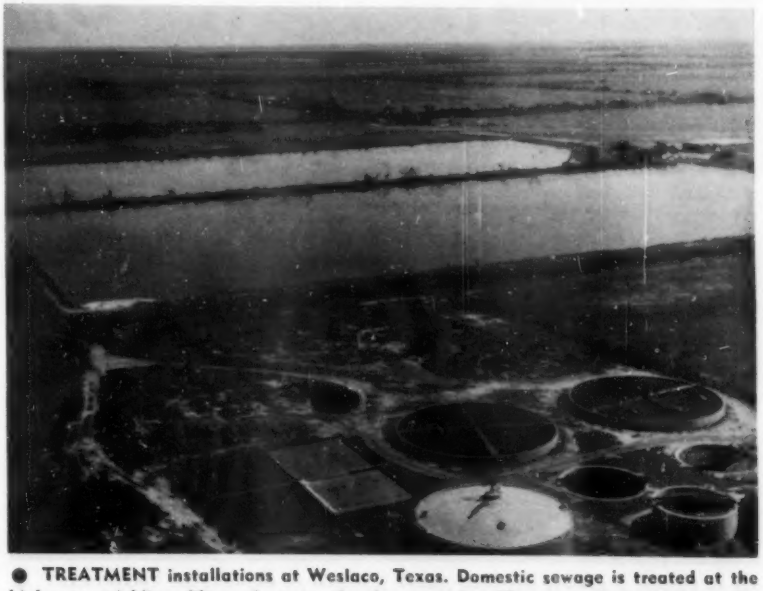
At Weslaco the cannery wastes were eventually deposited into Llano Grande Lake, a long, narrow, relatively deep body of water. During canning seasons, the lake lost its dissolved oxygen; fish were killed out completely; paint on houses was destroyed; and odors were produced which could at times be detected several miles distant.

Eventually, the city was served a court order prohibiting discharge of waste water of any kind to the lake. The city did not deny that the discharge of waste to the lake had created unsatisfactory conditions, but protested that, no economically desirable means of treatment of the waste had been proven by full plant scale operation. The investment of the canning industry, by far the largest in the community, amounted to several million dollars and the pay roll and the tax roll were matters of no small concern. A shutdown of the facilities was economically impossible.

The consulting engineering firm of Sigler, Clark and Winston was employed in the spring of 1954 by the City of Weslaco to design facilities for the treatment of the industrial waste. Joseph Winston as Chairman of the "Industrial Waste Disposal Committee" of the Lower Rio Grande Valley Chamber of Commerce, had been very closely associated with the "Citrus Canning Waste Research Project" which had operated four years in the Weslaco area. It was jointly sponsored by the Public Health Service, the Texas State Department of Health, and the Lower Rio Grande Valley Chamber of Commerce. Several other organizations assisted from time to time, such as the National Canners Association, the Texas Canners Association, and numerous cities, particularly Weslaco and Donna. Several local industries also lent aid to the project including the Taromina Packing Company and the Harlingen Canning Company.

The pilot plant studies of the research project included various modifications of activated sludge and trickling filter treatment, chemical precipitation, oxidation in ponds with and without nutrients, and yeast culturing.

Based on the results of the research studies and other factors, the consulting engineer specified the oxidation pond treatment. On account of the severe freeze of 1950, the citrus canning industry had declined greatly and the volume of aqueous waste was reduced markedly. Accordingly, for initial design basis, a volume of 300,000 gallons per day with a strength of 750 mg/L BOD was used. Sodium nitrate was to be added in suitable amounts to reduce the BOD of waste about 20 percent prior to entry to the ponds. Separate collection lines were constructed to serve the canneries and fresh fruit and vegetable establishments.



● **TREATMENT installations at Weslaco, Texas. Domestic sewage is treated at the high-rate trickling filter plant in the foreground; effluent is discharged to the two lagoons, where it mixes with screened waste water from local canning industries.**

Two equal size ponds with a combined area of 32 acres were constructed. Design was based on a BOD loading of 50 pounds per acre per day of the sodium nitrate treated waste. The discharge structure was designed to allow depth variations from zero to four feet.

Preliminary Results

The ponds were placed in service in December, 1954. They were not actually ready for use as the pond area had not been cleared and there were considerable debris, cane and weed subject to submergence. However, the canneries and fresh vege-

table sheds were in operation, and there was urgent need for treatment of the waste.

At first, the contributing firms were not familiar with the requirements for use of the waste disposal system and discharged wastes which had a high solid content, such as grapefruit rind, whole carrots, tomatoes, silt, etc. and as a result anaerobic conditions occurred with considerable odor nuisance. This condition continued and by January, 1955, it became evident that something else must be done.

A meeting of the industries contributing waste was called. It was well attended and the requirements for successful operations of the system were explained. The city ordinance requiring fine screening of waste was again stressed and it was made plain that noncooperative firms would be denied waste disposal service and would have to close. No recurrence of the initial gross misuse of the waste disposal system has resulted.

Domestic Sewage Plant

During this period, the domestic sewage treatment works designed by Sigler, Clark and Winston, was performing very well. The plant was designed for a population of 15,000 and an average daily flow of 1.5 mgd. The equipment includes a Camp regulator for the grit chamber and a Chicago Pump Co. comminutor. There are two 33-ft. diameter primary and two 40-ft. diameter final clarifiers, all Lakeside Spiraflo equipped. These may be operated in series or in parallel. Two 84-ft. diameter high rate trickling filters may also be operated in series if desired. A separate sludge digester and open air sludge drying beds are provided. The plant is equipped with an excellent laboratory and is supervised by well trained operating personnel.

It was decided to add sewage plant effluent to the industrial waste ponds. This was done for four reasons: 1) It was hoped that the plant effluent of a lower specific gravity would stratify on top of the ponds and create a smothering effect, containing the odors; 2) the effluent was known to be rich in nitrogen, available as food for biological activity and the waste was known to be deficient in nitrogen; 3) the available dissolved oxygen also could be utilized directly; 4) the valuable biological seed material present could assist in starting aerobic action in the ponds.

The above procedure was initiated in January, 1955, with a rate of application of effluent at about 400 gpm. Sodium nitrate application continued at a rate of 100 pounds per day. In five days, a DO value of about 6 mg/L appeared along with a pH of 8.3 showing that aerobic conditions had been attained and the odors ceased. The feeding of sodium nitrate was discontinued at this time and aerobic conditions were maintained through the best canning season.

Later in the year, the No. 1 pond became overloaded periodically, but prompt addition of sodium nitrate returned aerobic conditions quickly. The weather seemed to play a very important role in the operation of the two oxidation ponds. Sunlight and wind velocities of 10 to 20 mph contribute greatly to the successful operation. It was noted that on cloudy days the dissolved oxygen recovery is very slow compared to a day with sunshine.

During the next season of fruit and vegetable canning, begun in October, 1955, results were very good with no sodium nitrate required until the second week of January, 1956. It then became necessary to add nitrate at the rate of 200 pounds per day for 12 days by which time No. 1 pond recovered and nitrate feeding was discontinued.

As trouble occurred later, it was decided to try 400 lbs. per day of sodium nitrate in an effort to secure more rapid recovery and thus save on chemicals. This was successful.

During the period January, 1957 to May, 1959, the dissolved oxygen value in each pond was usually above saturation. A low value in June, 1958 in the first pond, caused by the shock of initiating tomato canning was overcome by the addition of nitrate.

Control Procedures

Dissolved oxygen and pH tests were relied upon principally to determine the condition of the oxidation ponds as these tests are rapidly made and quite significant. A drop in pH indicates death of algae while a rise in pH indicates favorable conditions. A drop in dissolved oxygen, of course, indicates loss of algae growth and also loss of treatment. There are minor variations due to weather conditions, particularly lack of sunshine. For example, on March 8th, the pH in No. 1 pond had dropped to 7.6 and DO to zero. It is assumed that if the nitrate treatment had not begun on March 9th, all the algae would have died and the results would have been very serious. The treatment would have been practically nil and considerable pollution of the normally dry floodway would have resulted.

Prior to the 1956-57 season, the average water depth of the ponds was raised from 2.5 feet to 3.5 feet and recirculation of pond effluent to influent was provided. This possibly assisted in maintaining aerobic conditions throughout both ponds all season. At no time during the 1956-57 season was it necessary to add any sodium nitrate as the introduction of domestic sewage plant effluent, plus oxidation pond effluent, was sufficient to provide complete treatment despite increased loadings.

The effectiveness of the system of adding domestic effluent to the industrial waste ponds has been proved repeatedly by experiment since each time the addition of domestic sewage effluent was withheld for two or three days deterioration of treatment occurred simultaneously.

The City of Weslaco received the Honor Roll Award at the annual meeting of the Texas Water and Sewage Association for the plant producing the best effluent for the year 1956. The combined discharge of domestic and industrial waste effluent had an average BOD of 8.0 ppm and DO of 2.0 ppm.

Although originally the City had quite a problem in securing the right of way for its effluent ditch now the adjacent farmers compete with each other to secure the effluent for irrigation of feed crops and pasture land.

The author wishes to express appreciation to Consulting Engineer Joseph B. Winston of Mercedes, Texas, and Sewerage Superintendent James Cross for data furnished for this article.

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Maintenance Cost of County Roads

The maintenance of county local roads in Oakland County, Mich., during 1958 cost $892,709, including labor, material, equipment rental, and indirect expenses for an average of approximately $510 per mile. These figures include culvert pipe, calcium chloride brine as a dust layer and contributions by townships and individuals.

Maintenance cost of County primary roads during 1958 was $1,350,-297 including labor, material, equipment rental, overhead, and indirect expenses, for an average of approximately $1,985 per mile.

CONSULTING FIRM CUTS COSTS AND SPEEDS DOCUMENTS WITH COPY MACHINE

A MONTHLY saving of $20 in office operating costs, increased efficiency and fewer hours spent doing manual duplication have been achieved by a municipal engineering firm since purchase of an electric copying machine.

Walter E. Deuchler Associates, Inc. of Aurora, Illinois, uses the new business machine to make duplicate copies of engineering drawings for use within the office as well as for distribution to contractors.

The firm has saved substantial time and money in making copies of drawings instead of sending them outside the office to be reproduced. Previously, delays were encountered in having extra copies made of blueprints, sketches and other engineering drawings resulting in inconvenience and a poor balance of office manpower.

It seemed logical to select some kind of copying device that would be low of cost, that could be operated by anyone in the office and that would make clear, durable copies.

Accordingly the firm selected a machine which makes accurate copies of 8½ x 11 engineering drawings in four seconds. A special heavy-weight paper is used to give durability to copies that will be used by contractors, builders and others in the field.

In addition to copying engineering drawings, the firm also uses the machine for making extra copies of graphs, charts, letters and reports on municipal engineering installations.

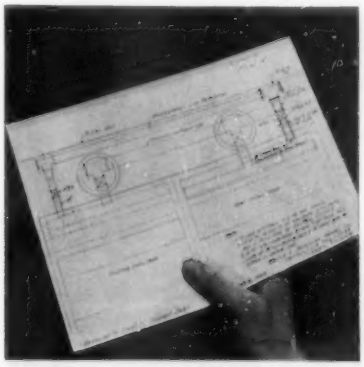
"Instead of having our typists spend long hours making duplicates of complicated reports, we let the machine do the job now," Walter E. Deuchler, Jr. says.

As Secretary of a chapter of the Illinois Society of Engineers, Deuchler uses the machine to simplify mailings to 175 society members each month.

By typing a master list of all addresses on regular paper, then running them through the machine along with a sheet of special gummed and perforated Thermo-Fax copy paper, as many as 42 labels can be made in four seconds. The original list can be used over and over again, eliminating the need for individual typings each time a mailing has to go out.

● **AN EXTRA COPY** of an engineering drawing can be made automatically in four seconds by use of this copying machine, owned by a consulting firm in Aurora, Ill.

● **SPECIAL** office job such as duplicating a mailing list is speeded by copying on perforated, gummed sheets.



● **ERROR-FREE** reproductions of original documents and drawings can be made on a special heavy-weight paper.

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Just one Hydro E-Z Pack unit is enough to pick up residential and commercial garbage and trash. Garbage, tree limbs, cartons, crates and "you-name-it" are tightly compacted in one load by the Big Squeeze Bulldozer. This compaction makes every load a "baled" load. E-Z Pack can eliminate three or more open trucks or ordinary packers. Make more routes in less time, fewer trips to the dump, and use less labor all around. Means lower costs for cities, more profit for contractors.

Prove it! Ask for a demonstration of Hydro E-Z Pack right on your route, or write for free copy of "The Big Squeeze."

COMMERCIAL—No need to break down large cartons or crates; E-Z Pack takes 'em as is!

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RESIDENTIAL—Garbage, ashes, junk, tree limbs, leaves, cartons, trash; E-Z Pack takes everything!

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NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Program Topics Set For 1959 Public Works Congress at Seattle, September 20-24

Seattle, Wash.—Roy Morse, Seattle City Engineer and General Chairman of the 1959 Public Works Congress and Equipment Show estimates that over 2,000 persons will be in attendance at this year's Congress—the first ever held in the Great Northwest. The Congress Program covers a wide variety of topics of vital interest to public works officials. The "Workshop on Administrative Problems", to be conducted under the direction of John Craig Oliver, Commissioner, Board of Administration, Vancouver, B. C., is a new feature of the Congress which will offer all delegates an opportunity to participate in round table discussions on problems dealing with planning, finance, personnel and public relations as they pertain to the public works field. PLAN TO COME. You'll find it well worth the time and expense to your city in terms of dollar dividends from learning of better methods and new ideas.

Street Excavation Ordinance Issued by Southern California Chapter

Los Angeles, Cal.—The So. California Chapter has published a Model Street Excavation Ordinance prepared by its Uniform Ordinance Committee.

The ordinance includes sections dealing with excavation permits; surety bonds; routing of traffic; relocation and direction of Utilities; protection of adjoining property; breaking through pavement; backfilling; restoration of surface; and maintenance of drawings.

Many members of the chapter contributed to the development of this ordinance, but most of the work was done by the Committee headed by Wade E. Peebles, Director of Public Works of Torrance, and the other committee members including James F. Martinek, Director of Public Works, Riverside; Frank E. Randall, Right-of-Way Superintendent, Pacific Telephone and Telegraph Company; David K. Speer, formerly Director of Public Works of Beverly Hills, now County Road Commissioner for the County of San Diego; C. C. Westmoreland, Southern California Gas Company; and Fritz Zapf, former City Engineer of Monrovia, now General Manager of the Public Utilities District in Fallbrook, Calif. Marl C. Allen, Jr., City Attorney for the City of Inglewood, reviewed the finished document and revised it to conform to established legal practice with respect to form and language.

C. C. Westmoreland, Supervising Engineer, Southern California Gas Company, Box 2349 Terminal Annex, Los Angeles 54, is Secretary-Treasurer of the Chapter.

APWA Holds Southeastern Conference in Gatlinburg

Gatlinburg, Tenn.—The Southeastern Public Works Conference held in Gatlinburg, Tennessee, re-

● **RECENTLY opened Alki Point Sewage Treatment Plant in Seattle is one of the many interesting projects to be visited by delegates to the 1959 APWA Congress.**

OFFICERS: Wm. D. Hurst, Winnipeg, Manitoba, Canada, *President;* Jean L. Vincenz, San Diego, Calif., *Vice President.* REGIONAL DIRECTORS: (term ending 1959) Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D.; Frederick Crane, Buffalo, N. Y.; (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Tex.; (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; W. A. Bowes, Portland, Ore. *Immediate Past President,* Sol Ellenson, Newport News, Va. Robert D. Bugher, *Executive Director.*

cently, featured discussions of a number of current municipal problems. Herbert M. Bates, Chief Urban Engineer of the Tennessee State Highway Department, pointed out that the money that is now being used to pay the state's 10 percent of the cost of the new highways on the Interstate System was previously being used on Primary, Urban and Secondary roads. "Thus," he said, "there are many much-needed improvements on the State Highway System which we are unfortunately having to postpone." J. D. Wright, Director of Public Works of Lynchburg, Va., said that the same situation is true in his state and that he questioned the wisdom of following such a policy.

"As important as this vast system of interstate highways is, I am wondering if we are not being overanxious in this one phase of highway construction to the detriment of a system that the states have built up over the years with highway revenues from the taxes derived by the states for this purpose.

"We all know that one of the major problems of the cities at the present time is trying to find enough revenue to furnish the services which our people demand. What will happen if we channel all our highway funds into the system of superhighways and encourage our citizens to move outside the city? We will not only lose taxable values, but will also be put to additional expense to provide more and better highways and streets in the city to provide access to these superhighways, in order that those citizens now living in the cities can move to the counties with low tax rates and still use all city facilities." Mr. Wright went on to say, "My own state is giving serious thought to this problem and, at a recent meeting of the General Assembly, passed a resolution requesting the Highway Department to review this interstate program and, if necessary, slow down the program rather than deny necessary state funds for proper maintenance and construction of our present highway system."

This same concern for people now living in established communities was also expressed at a session on "Subdivision Standards and Controls." Howard K. Menhinick, Regents' Professor of City Planning at Georgia Institute of Technology, explained that the new urban growth that lies ahead staggers one's imagination. Authorities, he said, have pointed out that in the next decade, at current rates, the *added* urbanized acreage will be as large as the total land area of Rhode Island, Connecticut, New Jersey, and Delaware put together. Professor Menhinick explained that most new developments are taking place in the suburbs outside city limits and stressed that it is very important that land subdivision control be exercised by the local governments of the unincorporated area or that the city be given authority to control development beyond its municipal boundaries.

Joseph C. Kordella, Chief of the Bureau of Engineering of the Montgomery County (Md.) Department of Public Works, voiced concern over the future of older residential and commercial areas in view of the fantastic growth that is predicted during the next 10 to 25 years. "Are we to continue devoting our efforts to future developments and give meager attention to the established communities that are already suffering from the effects of urban sprawl? These communities are being called upon to help pay for *new* road and street systems, *new* water and sewer projects, *new* incinerators, large storm drainage projects—and many other increases in what we call governmental services. If this situation continues we

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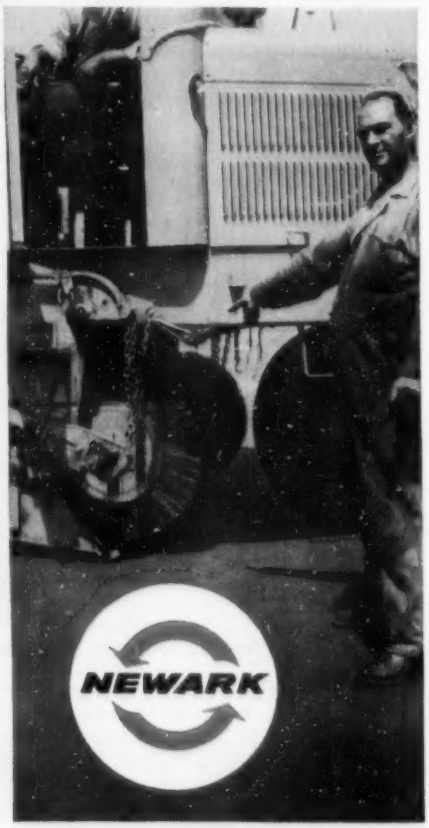

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can expect to see these older established areas become a sacrifice to new development. . . A weak approach to regulating new development can only result in tremendous future costs. On the other hand, a firm, well designed set of regulations can be the saving factor in our future."

City Manager John M. Gold of Winston-Salem, N. C., said that managerial practices must keep abreast of the times; that staff agency assistance must be used to a greater extent and that more and more responsibility must be delegated to line department officials as governmental organizations increase in size and complexity of operations.

Walter E. Schwanhausser, Jr., Manager of the Applications Engineering Division of the General Electric Company, speaking on "Street Lighting Trends and Developments" said that the motorist fatality rate is 2½ times as bad at night as by day. "Tangible proof of how one pays indirectly for traffic deaths is this year's savings in insurance premiums for residents of the State of Iowa. They were able to effect a reduction of 95 traffic deaths in 1958. As a result, their premiums were reduced about 9 percent, averaging $9.00 per policy, or a total of $16,000,000."

The Conference closing luncheon featured a talk on "Public Works in the National Economy" by A. R. Jones, Director of the Tennessee Valley Authority, who said, "Public works are not an end in themselves, but must contribute to growth, stability and the future of a region and the Nation. Although they now constitute about one-third of the $50 billion construction industry, the demands for such developments are unlimited and double the present amount could be easily justified."

Murphy U. Snoderly, Public Works Consultant for the University of Tennessee's Municipal Technical Advisory Service served as General Chairman of the Conference.

Rapid Transit Planning Topic At Northern California

Berkeley, Calif. — Kenneth Hoover, Chief Engineer of the San Francisco Bay Area Rapid Transit District reported on the organization and progress of Rapid Transit planning for the Bay Area at the May meeting of the Northern California Chapter. Hoover compared the 1940-1959 population growth of the U. S., the State of California and

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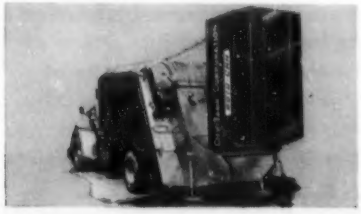

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the nine-county Bay area, pointing out that while the National increase was 33 percent, the population of the state and of the Bay area more than doubled. Predictions are that the population will double again in the next 20 years. He stated that "The population is not only increasing by leaps and bounds, but its demands are also much more extravagant . . . The result is that travel demand is increasing at a much more rapid rate than is the population . . . While the automobile is the most convenient vehicle ever devised for any variety of travel, it is too extravagant in its use of space to permit its all-inclusive use by people in city areas . . . it is now generally agreed that a combination of highways with good modern rapid transit will give the best (and probably the only) solution to the metropolitan transportation problems."

Outlining steps in the development, Mr. Hoover pointed out that the State legislature created the Rapid Transit 'Commission' in 1951. This Commission was responsible for making the most complete transportation study ever carried out in any metropolitan area. The formation of the present 'District' was a recommendation of the Commission's report completed in 1956.

The 'District' organization differs from an 'Authority' in that the District directors remain completely responsive to the desires of the governing bodies of the Counties and thus to the people.

Racine City Engineer Elected President of Wisconsin Chapter

Wisconsin Rapids, Wisc.—William Chadwick, City Engineer of Racine, was elected President of the Wisconsin Chapter at the annual meeting held in Wisconsin Rapids, May 21 and 22. He succeeds Robert E. Fleischer, Director of Public Works, Sheboygan. Edwin Duszynski, Director of Public Works, Appleton, was elected Vice-President and John G. Thompson, City Engineer, Madison, was reelected Secretary-Treasurer. Hiram Krebbs, Stevens Point, and William Rheinfrank, Milwaukee, were elected to serve as Directors joining W. J. Blong, Village of Fox Point, and E. C. Bennett, Beloit.

The technical program featured presentations on "Annexation Legislation" and "Zoning and Land Use" by Walter Johnson, Planning Director, Madison, and "Personnel Recruitment, Training and Promotion" by Carl K. Wettengel, Personnel Director, State of Wisconsin.

Presentation of a certificate of appreciation for completion of ten years of public agency membership was made to Robert Duncan, Village Manager, Shorewood, by Louis Moehr, City Engineer of Wyandotte, Mich., and APWA Director of Region No. 5. In making the presentation, Mr. Moehr pointed out that Shorewood was one of five cities to receive this distinction in 1959. The fact that the Association now has almost 250 public agency memberships emphasizes the tremendous growth of the APWA.

Flowers, Litter and Emergencies Topics at Missouri Meeting

Columbia, Mo.—The First annual meeting of the Missouri Chapter was held June 5 & 6 at the Tiger Hotel, Columbia, Mo. Al Mauro, Administrative Assistant to Kansas City's City Manager moderated a discussion on the Litter problem and its effect on public works. The Participants concluded that education enforcement, service, and the cooperation of civic groups were the "magic" ingredients to a successful

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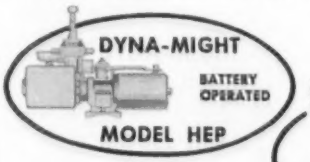

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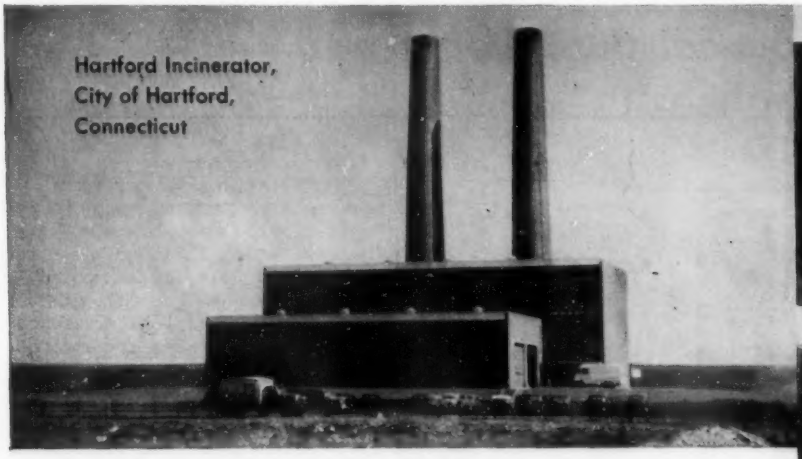

Hartford Incinerator,
City of Hartford,
Connecticut

(1) Hartford's Fitchburg Chipper

(2) Fitchburg Chipper in action

Modern Hartford disposal plant uses FITCHBURG CHIPPER

Hartford's new municipal incinerator is used to dispose of more than 400,000 pounds of waste every day. The large picture above shows this efficient, attractive plant—one of the most modern in the nation.

An important part of Hartford's up-to-date disposal program is their portable Fitchburg Chipper, which cleans up disposal jobs the incinerator cannot handle, and goes out on location for road use.

Hartford had these problems:

- *Banana Stalk Disposal*
- *Brush Disposal on New Roads*
- *Christmas Tree Disposal*
- *Road Clearance from Storm Damage*

How a Fitchburg Chipper solves these problems:

Joseph J. Coffey, Superintendent of the Hartford Incinerator, tells you in his own words how Hartford solves these problems: BANANA STALKS: "We chip 2 to 4 tons of banana stalks each week. These stalks will not burn regardless of heat in the furnaces, and we had to dump them until the Fitchburg Chipper went on duty." CHRISTMAS TREES: "During the post-Christmas season we receive many Christmas trees which we can now get rid of without the trouble of watching for burnt-down spike-like stubs which cause much trouble with the incinerator equipment."

BRUSH DISPOSAL: "Our Highway Division has used our Fitchburg Chipper to clean up the brush and branches along newly developed road areas. By chipping brush, the city saves in use of both manpower and trucking costs." ROAD CLEARANCE: "If we get hit again by hurricanes or bad wind storms, we now have an excellent piece of equipment that will enable us to readily open up the streets for emergency traffic by reducing the fallen branches to chips."

As to maintenance, Mr. Coffey says: "Our Fitchburg Chipper will pay for itself in a very short time. Maintenance, so far, is just keeping it supplied with gasoline and fully lubricated. It is easy to handle, easy to store, and very easy to use."

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The Shade Tree Service Company, Webster Groves, Mo.: "Our figures show that production has been increased by a good 25% with the use of the Fitchburg Chipper. One man can operate the chipper with ease. He alone can handle as much, and more, brush in the same length of time as could two men loading brush on a platform body."

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Rockland Light and Power Company, Nyack, N. Y.: "Our men have been particularly pleased with their Fitchburg Chippers. They are rugged and reliable and the convenience of flexible, yet instant brush disposal has the advantage of promoting good public relations and still gives us efficiency."

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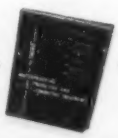

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anti-litter program. Orvis Massey, City Engineer, Neosho, described that city's successful efforts of beautification through a civic program of encouraging the special installation and arrangement of flower boxes on residential, commercial, and governmental properties. Clarendon Rea, Commissioner of Refuse Collection, Kansas City, described the K. C. Litter program, remarking that one of the extra unforeseen benefits in giving out free plastic auto litter bags (cost less than 2¢ each) when citizens obtained their city licenses for their cars, was that substantially fewer complaints about the cost of the licenses (and high taxes, in general) were reported by the license clerks. Earl W. Deering, Commissioner of Refuse Collection and Disposal for St. Louis reported on that city's practices and included references to studies on alternate methods of combined collection of refuse made as a result of Federal action against the city concerning termination of the practice of discharging garbage from central grinder stations to the Mississippi River without treatment. A session on public works responsibilities in emergencies included presentations on Facilities Available for Warning Systems by R. E. Crews, Director of Public Works, Joplin, who described the use of field radio and "Ham" radio operators in emergency communication setups; and a paper on "Floods" by Reed McKinley, Acting City Manager of Kansas City. Mr. McKinley stated that "Should you have reason to anticipate a serious flood make certain of: Information and alert procedure; chain of command at warning; arrangements for rapid mobilization; heavy equipment is ready to move; knowing availability of contract equipment; and maintaining a highly efficient communication center."

Also participating in the panel presentation was Joseph Hatton, Federal Civil Defense Admin., Battle Creek, Michigan and David Pence, City Manager of Excelsior Springs, Mo. After fulfilling his pledge to the Excelsior Springs Chamber of Commerce concerning life in that resort city, Mr. Pence outlined how Excelsior Springs planned for Emergency Operations not by concern for "H" bomb attacks but by accomplishing a readiness for disaster through formation and promotion of a rescue squad organization for "ordinary emergencies".

At the annual banquet, Elroy F. Spitzer, Engineering Editor, Ameri-

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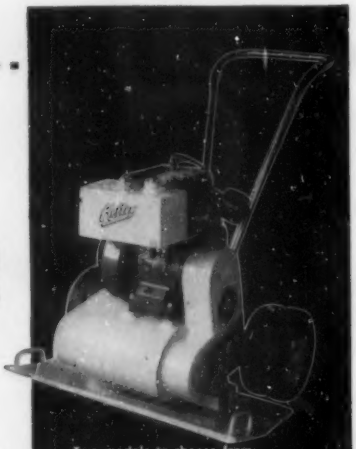

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can City Magazine, recounted tips on "maneuvering and contriving" to achieve difficult public works needs —such as raising water rates—with a minimum of public resistance. A certificate of appreciation for ten years of public agency membership for St. Charles, Mo. was presented to James Hamilton, Councilman, of that city by Leo Weaver, Assistant Director of APWA.

At the annual business meeting, R. E. Crews was elected President to succeed W. E. Hedges, Director of Public Works, Springfield, W. R. Miller, City Engineer, Columbia, was elected Vice-President and Orvis Massey, Secretary-Treasurer. Elected Directors were C. Clarendon Rea and V. V. Napolilli, Asst. Director of Public Works, University City.

228 Attend Chicago Chapter Annual Spring Meeting

Chicago, Ill.—Once again the weatherman smiled on the Chicago Chapter and supplied a beautiful day for the annual spring golf outing held on May 21 at the Midwest Country Club in Hinsdale, Illinois. The all-day meeting attracted 228 members and guests with 45 manufacturers and distributors of public works equipment serving as sponsors.

The dinner program featured Lou Boudreau, major league ball player and manager, as guest speaker and included a short business meeting with an election of new officers. Elected to the Presidency was Armon Lund, Superintendent of Public Works, Wilmette, Ill. William S. Harte, Assistant Supt. of Sanitation of Chicago, was named 1st Vice President; John Walsh, Assistant Manager of the Village of Riverside, 2nd Vice President; and Thomas Petrick, Division Superintendent, Bureau of Sanitation, Chicago, Secretary-Treasurer.

• • •

County Plumbing Ordinances

Legislation recently passed in Indiana permits county commissioners to adopt plumbing ordinances. Previously, there were no statutory provisions whereby counties could regulate plumbing. This act provides for establishment of minimum plumbing standards, inspection, issuance of permits and provides for employment and payment of plumbing inspectors and other necessary expenses. It also provides penalties for violation.

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NEW OLIVER 550—today's newest utility tractor—with engine and built-in hydraulic system matched to perfection. It's fast, agile, full-powered. Its compact size lets it get in and out of tight spots quickly. Gas or diesel; independent PTO; six forward speeds, two reverse. Offers all big-tractor features at low price.

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IT'S POWERFUL—with the highest ratio of h.p. to weight of any backhoe on the market. It delivers a 9000-lb. breakaway action, digs to 12′, loads to 8′8″.

IT'S FAST—with completely hydraulic operation, 188° arc of swing, fast work cycles, greatest production at lowest cost. Operator can quickly change from backhoe to loader by merely changing seats.

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METAL JETTIES
SAVE MONEY on BEACH PROTECTION

THOMAS M. REED
Superintendent of Public Works, Savannah Beach, Georgia

LIKE MANY other coastal cities, Savannah Beach, Georgia, must construct groins or jetties to build up the shore line and keep the ocean from gouging away valuable beach property. Creosoted timber is the usual construction material for jetties; however, the Public Works Department of Savannah Beach has discovered that both time and money can be saved by using Asbestos-Bonded and asphalt-coated corrugated metal sheets instead.

The first installation of this type was made in 1955 when a 300-foot jetty was constructed. Before that time the beach was about nine feet below the top of the sea wall. Since the installation of the corrugated metal jetty, the beach has filled in so that it is now only three feet below the top of the sea wall.

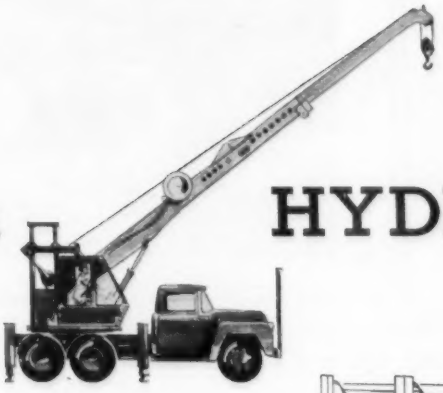
This very satisfactory performance led to the installation of a similar jetty in the early spring of last year. This one is 500 feet long and is made of 250 pieces of Armco Asbestos-Bonded and asphalt-coated corrugated metal sheets. The sheets are 12-gage material, 25½ inches wide by 156 inches long, and were supplied with a hole punched in each top corner.

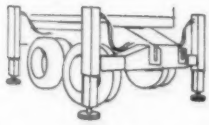
To make the installation, creosoted piles were first jetted down on 4-foot centers. Two wales were bolted to the piles, one along the top of the piles and the other about 3½ feet below the first. The sheets were then jetted into place. The top of each sheet was sandwiched between the attached wale and another wale. This was made fast by driving 30-penny nails through the wales and through the prepunched holes in the sheets. Holes were field-punched in the sheets in order to attach them to the bottom wales. After the sheets and the two sets of wales were in place, another row of creosoted piles was jetted into place and attached to the wales.

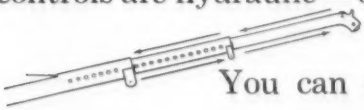
This corrugated metal jetty cost one-third less than a comparable one of creosoted timber. The experience of the Savannah Beach Public Works Department also indicates that corrugated metal jetties are more quickly installed.

● **JETTY** was constructed near Savannah Beach, Ga., to prevent erosion of beach property. Creosoted piling is first put down by water jetting, walers are placed and then asphalt coated corrugated metal sheets are used. This shows finished job.

● **SHEETS** of 12-gage metal are used. These are jetted into place. Here the sheet has been raised and the men are sinking it into place for spiking to the walers.

This is a  HYDROCRANE!

It will lift 24,000 pounds. Its outriggers  operate hydraulically and individually — within seconds to keep you level when you work. The controls are hydraulic — oil-smooth. The boom on a Hydrocrane is telescoping.



You can add 12 feet to your reach *on the move*, without stopping! The standard boom can be 24 to 36 feet long, the high lift boom can be 38 to 50 feet long — or even 70 feet long with the jib! The Hydrocrane travels over streets, highways, in plant yards as easily and fast as your pickup trucks. Does it work? It works so well that over 50% of the customers* who have ever bought a Hydrocrane. have bought another!

*Who are they? They're municipalities, utility companies, precast concrete people. They're steel erectors, contractors and loggers. And, there are many more every day. **See your Hydrocrane distributor for a free demonstration,** or write Dept. 37HA, Bucyrus-Erie Company, South Milwaukee, Wisconsin.

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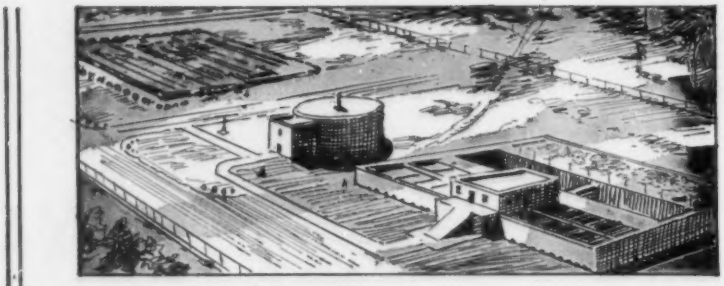


Prepared by **ALVIN R. JACOBSON, Ph.D**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Treatment Cost Reduction

At the present time, five out of every six states are exerting a significant measure of control over design of sewage and industrial waste treatment works. The extent to which the agencies are effective depends on many factors: a) State water resource policy; b) the legislation and appropriations under which the agency functions; c) the relative abundance of surface water under its jurisdiction; and d) the individuals immediately responsible for administering the agency's program. In discussing the role of the state agency and its effect on the over-all cost of sewage treatment, it seems logical to consider the subject in terms of four general phases: a) Promotion; b) preliminary engineering; c) design and construction; and d) operation. The author discusses each of these phases in detail.

"State Responsibility For Cost Reduction In Waste Treatment Facilities." By Walter W. Saxton. *Sewage and Industrial Wastes*, June, 1959.

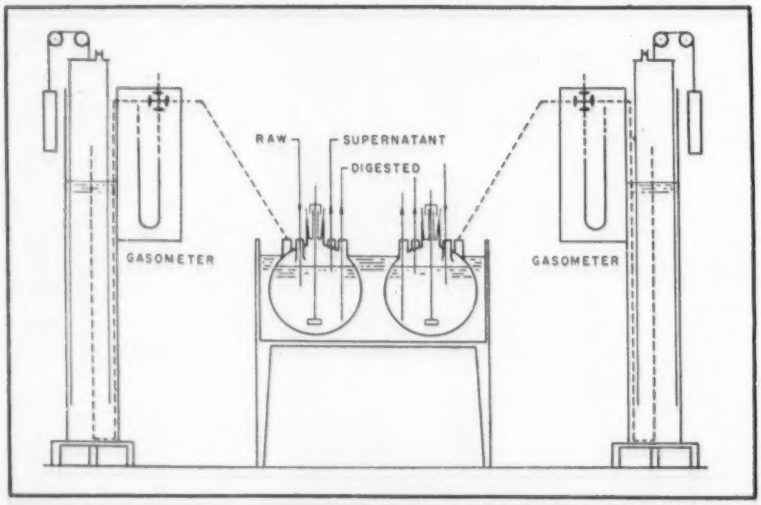
Digestion Experiments

Anaerobic digestion of sewage solids is a complex phenomenon. The heterogeneous nature of the raw sludge and mixed bacterial population has prevented a complete understanding of the factors influencing digestion. This investigation was performed to determine the effect of one of these factors, the rate of loading, on the anaerobic digestion process of raw sludge. Ten liters of digesting sludge obtained from the primary digester of the Pullman, Wash. sewage treatment plant were placed in each of the two laboratory digesters operating under identical conditions. A detention time of 33 days was maintained throughout the study. The rates of volatile solids loading selected for study were 0.05, 0.075, 0.10, 0.11 and 0.135 lb/day/cu. ft. of digester capacity. This study indicated under normal operational conditions that the following will occur: (1) At increased loading rates, an increase in these chemical characteristics occurred; a) total volatile organic acids, b) alkalinity, c) suspended solids in supernatant, d) relative quantities of butyric acid and proprionic acid, e) relative amounts of carbon dioxide in the gas, and f) volatile solids content of the digested sludge. (2) At increased loading rates, a decrease in the following occurred: a) Gas production per unit of volatile matter added per unit of time, b) volatile solids reduction, and c) the relative quantity of acetic acid. (3) Increased loading rates did not affect the pH. (4) Total gas production was inhibited when the total volatile acids were present in excess of 2,000 ppm as acetic acid. (5) A critical loading level exists.

"Some Characteristics of Anaerobic Sludge Digestion." I. Effect of loading. By Lee E. Mueller, E. Hindin, J. V. Lunsford and G. H. Dunstan. *Sewage and Industrial Wastes*, June, 1959.

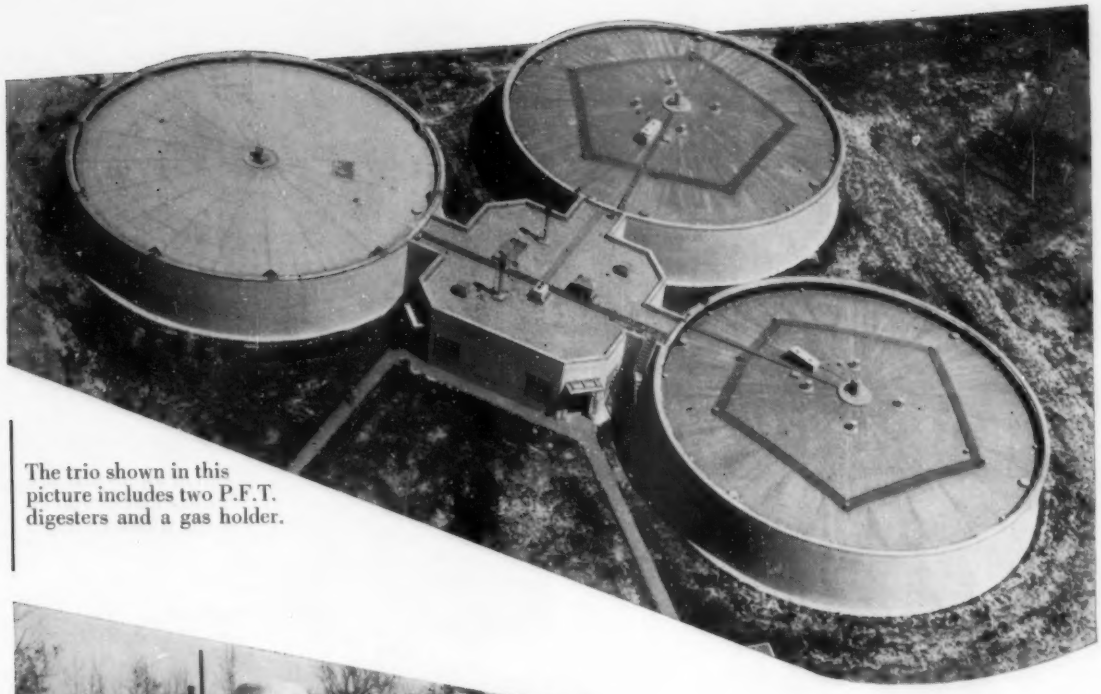
Composting Sludge

Santa Rosa, California, has found a new method of drying and disposing of its sewage sludge by composting it with wood shavings and street sweepings. It has experienced difficulty in drying sludge during periods of wet weather for several years. Visits were made to other plants where this method had been in operation to observe their results. As soon as the decision was made to attempt this type of operation a contract was signed to have the work done in this manner for a year. The procedure was to harrow all eight sludge beds which were filled with partially dried sludge. Sufficient wood shavings were obtained to use on one sludge bed. The material was spread over the



Courtesy Sewage and Industrial Wastes

● **SCHEMATIC diagram of the laboratory equipment used for studies of digestion.**



The trio shown in this picture includes two P.F.T. digesters and a gas holder.

Close-up showing one of the P.F.T.-Pearth Gas Recirculation Systems as installed on Floating Covers.

Louisville Helps Restore The Beauty of "The Beautiful Ohio"

It is only natural that a city that has enjoyed such a tremendous business growth would also be one of the major factors in the "Clean Waters for Ohio" program.

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dried sludge bed, then the liquid sludge was spread on this bed. During monthly intervals the sludge shavings mixture was harrowed and one week after harrowing, the area was again filled with liquid sludge. On this original test bed a total of 100,500 gallons, or 62,500 pounds of sludge, by dry weight, were applied on a sludge bed 50 x 100 feet in size. Not including the original dry sludge cake, over twice what could formerly be applied had been added to this bed without the use of any labor to clean the area. The author relates other similar experiences using street sweepings and wood shavings as a base for the drying of the sludge.

"A New Way to Handle Sludge—Compost It With Wood Shavings." By Murray B. McKinnie. *Wastes Engineering*, June, 1959.

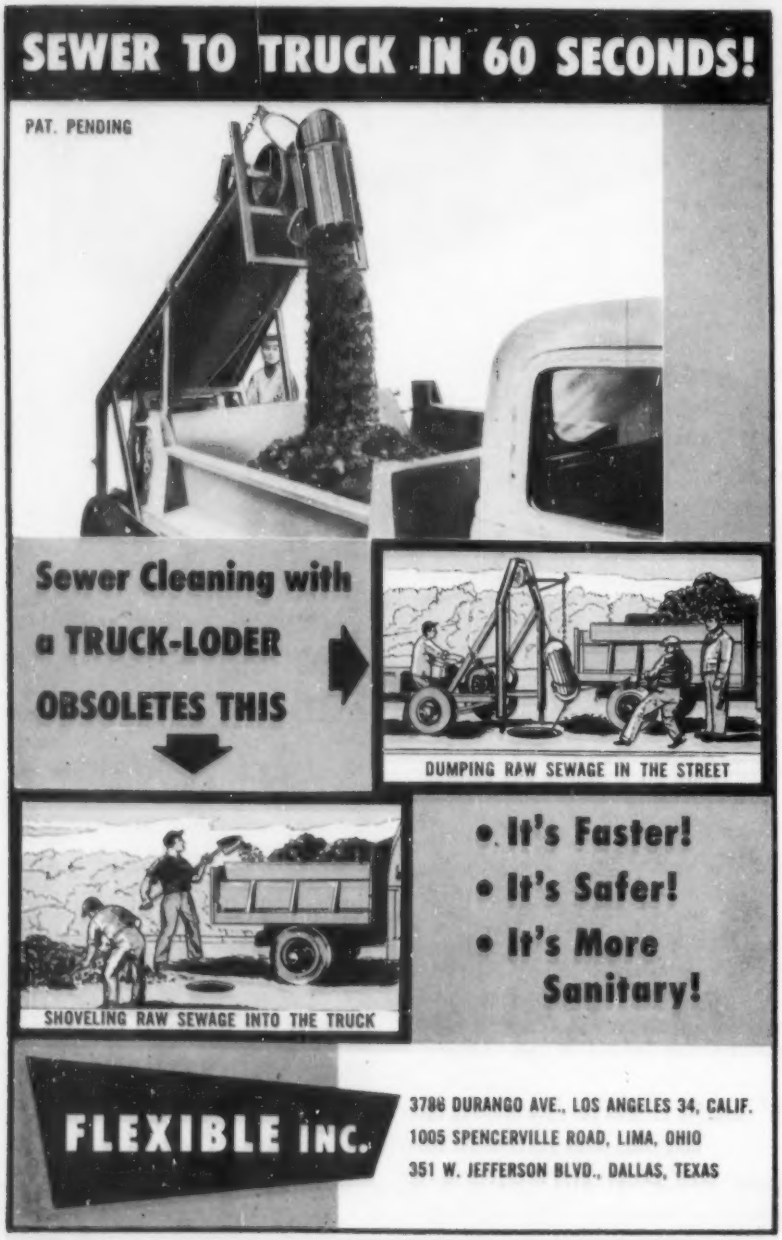
Laboratory Bench Units

The difference between results obtained in bench scale units and in prototype equipment or even bench scale and pilot plant units may be partially attributed to differences in process environments. Bench scale experiments can yield valid design data if process variables are controlled. The author discusses briefly some of the desired characteristics of a bench scale unit for the study of biological oxidation. In order that the process variables are to be properly evaluated, the following should be provided: 1) Continuous flow for uniform organic loading. 2) Metered aeration. 3) Positive suspended solids control. 4) A hydraulic loading similar to full scale requirements. A bench scale unit, developed at Rice Institute, embodying these characteristics is described in this article. A schematic diagram and photograph of the bench scale bio-oxidation unit are included. Precautionary comments are also included for the guidance of the investigator.

"Laboratory Units for Bench Scale Studies." By A. W. Busch. *Water & Sewage Works*, June, 1959.

Cincinnati Builds the Best

Cincinnati and 26 political subdivisions are investing about $60 million to be sure that the "Beautiful Ohio," a river exalted in song and legend, stays that way. In 1948, the eight states bordering the Ohio River formed the Ohio River Valley Sanitation Compact, known as ORSANCO, giving this body the power to police the river and remove polluting impurities and at the same time developed standards of water purity for that portion of the Ohio River known as the Cincinnati Pool, created by navigation dams. Cincinnati's liquid wastes are heavily loaded with pollutants, with suspended solids averaging 500 ppm and 5-day BOD, 400 ppm. Orsanco concluded, after detailed studies, that these wastes would not damage the river if the polluting material were removed to the following standards: Substantially complete removal of settleable solids; 45% removal of total suspended solids; and reduction by not less than 45% of 5-day BOD. With this as a guide, and with the assurance that the other communities would make similar contributions to the river's improvement, Cincinnati proceeded with their improvement program which consists of three plants able to purify over 150 million gallons per day. The first of these, the Little Miami plant, can receive roughly 20% of this total and was completed in 1953. The second, being dedicated this month, called the Mill Creek Sewage Works, is the backbone of the entire purification pro-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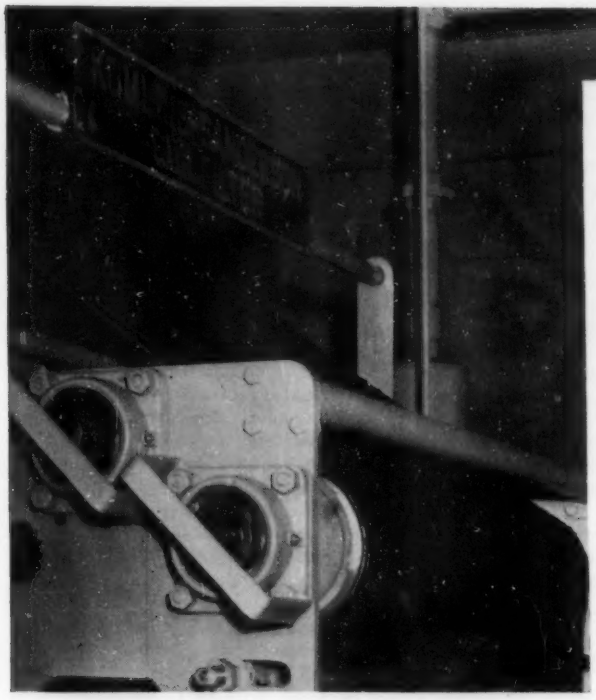

Illustrated above: Elizabethton, Tenn., Sewage Treatment Plant, Consulting Engineers: Allen & Hoshall

NO. 4 OF A SERIES

THE FACTS ABOUT FRESH SOLIDS DEWATERING

DUAL VALVE SLUDGE PUMPS

"BUILT FOR WEAR . . NOT REPAIR"

The successful fresh solids dewatering system depends upon its auxiliary equipment, as well as its major component, the Coilfilter. Such auxiliaries are:

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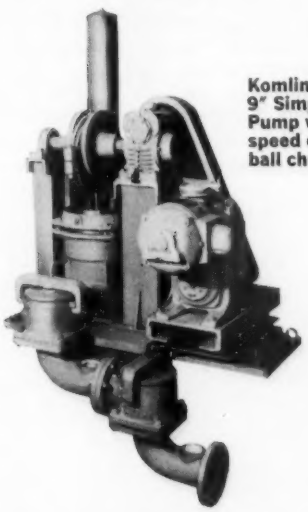
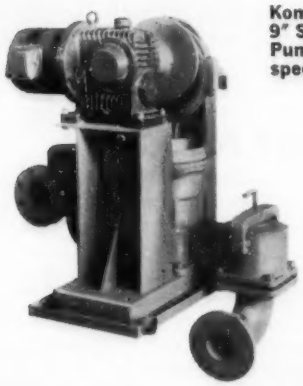
2. **Vacuum Pump**
3. **Conditioning System**

Komline-Sanderson heavy duty plunger pumps include 35,000# psi tensile strength iron for all castings. Constant speed motors with new type drive mechanism eliminate V-belts or pulleys, reducing the dimensions of the base plate by approximately 40%. Valve chambers incorporate large open areas, minimizing clogging, increasing velocity of sludge and reducing "settling out" of sludge.



Komline-Sanderson 9" Simplex Plunger Pump with variable speed drive and dual ball checks.



Komline-Sanderson 9" Simplex Plunger Pump with constant speed drive.

Dual ball check valves assure uninterrupted flow and constant, positive metering. Stuffing boxes are large, using ¾" square packing to provide the optimum in sealing characteristics.

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gram. It will be able to receive an average of 120 million gallons daily, or over 75% of the total contributed. The third plant is scheduled for completion in 1960 and will have a capacity of 7 million gallons per day. The author has described these plants in detail. To finance this system, a sewerage service charge has been adopted, based principally on the amount of water used.

"Cincinnati Builds the Best by Test." By C. A. Harrell and A. D. Caster. *The American City*, June, 1959.

Integrated Sewer Planning

The problems encountered by the Village of Richfield, Minnesota, a suburb of Minneapolis, in developing water and sewer systems to replace private wells and cesspools, are typical. This village, comprising an area of approximately 8 square miles, had a population of 3,800 persons in 1940 which had jumped to 36,500 in 1956. A 15-man lay committee engaged a consulting engineering firm to review the sanitary problems of the village and submit recommendations for development of an overall system. This study was completed in 1952. A complete set of master plans of the storm and sanitary sewer layout was prepared. This plant when completed proposed that approximately 130,000 l.f. of main trunk sewer, 600,000 l.f. of lateral sewer, and 500,000 l.f. of house service sewer would be required. Construction of the trunk sanitary sewer was begun in March, 1953, and completed by January, 1955, at a total cost of $2,767,718. A total of 121,773 l.f. of main line sewer and 45,949 l.f. of house service sewer were installed. Four lift stations and one meter station were constructed at a cost of $159,251. Any municipalities contemplating sewer and water construction might well follow the lead of Richfield in developing a long-range overall master plan for its major utilities.

"Suburban Sewers Cost Less with Integrated Planning." By Fred G. Goff. PUBLIC WORKS, July, 1959.

County Solves Sewage Problems

The rapid growth of the metropolitan area adjacent to the City of Sacramento, together with the leap-frog pattern of the related subdivision developments has caused problems in financing and constructing the most economical sewage disposal facilities. The construction of County operated and maintained sewage collection and disposal facilities was started in 1946. Since then over 440 miles of trunk and lateral sewer systems, 11 sewage treatment plants, and 33 sewage lift or pumping stations. have been constructed. All of these sewage works are contained within five active Sanitation Districts and 12 Sewer Maintenance Districts. One of the first problems that had to be overcome in order to provide public sewage disposal systems was to build an organization to administer, operate, and maintain these facilities. Another step which was taken was to require developers to construct sewage treatment works and trunk lines large enough to serve the ultimate population of their subdivision development. The 11 treatment plants that are in operation vary considerably in their design capacity. Also almost every type of treatment process used today in modern sewage treatment practice has been employed, requiring the operating personnel to be versatile and flexible in order to keep pace with the different processes and the problems peculiar to each individual plant. The laboratory control pro-

*THE NAME ORANGEBURG AND THE SILVER BAND ARE REGISTERED TRADE-MARKS OF THE ORANGEBURG MANUFACTURING CO.

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All these qualities plus speed, ease and economy of installation have gained for Orangeburg a growing acceptance among leading approving authorities, architects, engineers, builders and plumbers. Today, over 300 million feet of Orangeburg are in service from Maine to California.

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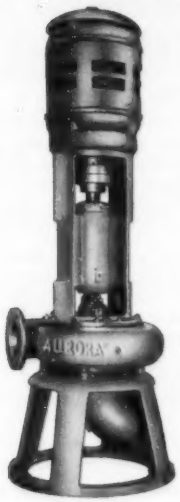

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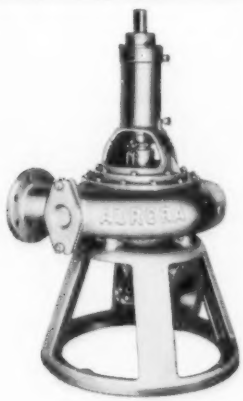

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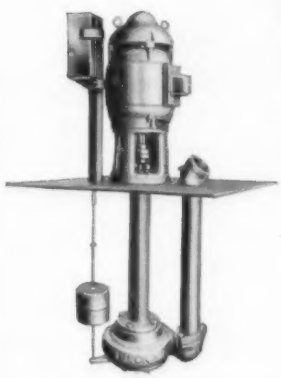

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gram for the operation of all the County plants is done at a central location. Telemetering equipment is to be installed in the near future to monitor the critical pumps, chlorinators and other essential equipment at the outlying plants on a 24-hour basis.

"How a County Solves Its Sewage Disposal Problems." By William F. Pillsbury. PUBLIC WORKS, July, 1959.

Other Articles

"Does Your Utility Have a Successful Safety Program?" **A good safety program** starts with effort and finishes with heart and organization. Here is an outline of a program that will work for you. By Arthur J. Webb. Public Works, July, 1959.

"Marine Pollution." This article presents a summary of the amount, type, and effects of **waste discharges entering the marine waters** of southern California. By D. J. Reish and J. L. Barnard. Water & Sewage Works, June, 1959.

1958 Literature Review. **A review of the literature of 1958** on sewage, waste treatment, and water pollution. This second of three sections of the Literature Review covers industrial wastes, including those of a radioactive nature. By H. Heukelekian, Chairman et al. Sewage and Industrial Wastes, June, 1959.

"Eight Industries and 11 Cities 'Pay the Freight' For Authority Plant." **Participants in county project pay for treatment** on basis of BOD, flow, suspended solids and chlorine demand. By M. C. Rand, Wastes Engineering, June, 1959.

"Sewer Cleaning Saves $7 Million" out of an estimated $8 million sewer restoration project in Mexico City. By Sr. Ing. Edwardo Molina. The American City, June, 1959.

"Louisville **Sewage Purification"** cuts costs by utilizing incinerator heat, employing new process methods. By Morris Forman. The American City, June, 1959.

"Stream Life and the Pollution Environment." A pictorial presentation to show the **impact of pollution upon the stream environment** and its biological life. By Alfred F. Bartsch and William Marcus Ingram. Public Works, July, 1959.

"Transformation Des Immondices et Gadoues en Compost. A description of the Dorr-Oliver process and equipment for **composting of refuse** and contents of cesspools. By P. Pelzer. La Technique de L'eau. Brussels, Belgium, Mai, 1959.

"Traitement de l'Eau" par storage, coagulation et decantation. Chapitre II. La decantation des eaux floculees. par P. Blancharel. Techniques et Sciences Municipales, Paris, France, Avril, 1959.

"Response of Fish to Sub-Lethal Exposures of **Organic Phosphorus Insecticides.**" The presence of organic

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Controls are simple, foolproof. Operator has positive control, can stop mechanism instantly. Engineered for less maintenance with fewer moving parts, less linkage, fewer adjustments.

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phosphorus insecticides in water has been shown to produce a specific reaction in the activity of brain enzyme acetylcholinesterase of exposed fish. By Charles M. Weiss. Sewage and Industrial Wastes, May, 1959.

"Blower Characteristics, Selection and Maintenance." The basic characteristics of the blowers used in sewage treatment plants. By G. R. Kunze. Water & Sewage Works, May, 1959.

"Wastewater Technology in Germany." In this second part of a two-part article on recent progress in sewage treatment technics, the author discusses secondary treatment and sludge digestion. By Ing. H. Rhode. Water & Sewage Works, May, 1959.

SOLID WASTE CODE APPROVED

The "Solid Waste Code of New Jersey (1959)" approved March 16, 1959, by the State Department of Health is given in full below.

Section 1—Definitions

1.1 Definitions — the following terms used in this code and ordinance shall mean and include:

(A) Refuse: Garbage, combustible and/or noncombustible waste solids.

(B) Garbage: Animal and/or vegetable solids resulting from the handling, preparation, cooking and/or consumption of foods.

(C) Combustible Waste: Yard trimmings, rags, waste wood or cardboard and other combustible waste solids of a nonvolatile or explosive nature.

(D) Noncombustible Waste: All solid waste material which does not burn.

Section 2—Refuse Receptacles

2.1 The owner, agent, lessee, tenant or occupant of every dwelling or other premises where refuse accumulates shall provide and keep on such premises sufficient and suitable receptacles, with tight-fitting covers, for receiving and holding the aforesaid refuse.

(A) Sufficient is defined for the purpose of this section, to be at least one receptacle for each family unit or other occupant of premises and at least two such receptacles for each restaurant, market, store or similar business establishment where the aforesaid refuse shall accumulate.

(B) Suitable is defined for the purpose of this section, to be a watertight metal or plastic receptacle with a tight-fitting cover, so constructed as to prevent spilling or leakage of its contents. Each receptacle for use at a single residence shall have a capacity of not more than 30 gallons and be equipped with a pull handle or handles.

(C) Receptacles for refuse from multi-dwelling units or industrial premises may have a greater capacity than that prescribed in (B) hereof provided they are:

1. Watertight.
2. Constructed of metal or plastic.
3. Equipped for handling by motorized equipment.
4. Cleaned and sanitized as needed after emptying.
5. Replaced by the same type of receptacle if removed for emptying.

2.2 Receptacles that are badly broken or otherwise fail to meet the requirements of this section, may be classed as refuse and collected and disposed of as such by the person or agency responsible for the collection of refuse.

2.3 Receptacles of refuse shall not be set out for collection except during hours of the day or days sched-

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The Horton Portable Water Cooler is in greater and greater demand in the construction industry. It's packed with value. Check these features: **Rugged, galvanized steel double wall** • Standard dead air space or Heavy Duty Vermiculite insulation • **Purolining, non-toxic inner coating** • Perfect fit lid • **Original recessed spigot** • Riveted, easy-grip handles • **Rounded, sanitary inside bottom** • Solid bottom support • **Complete size range: 1½ gal. thru 30 gal.** All sizes available with stainless steel liner.

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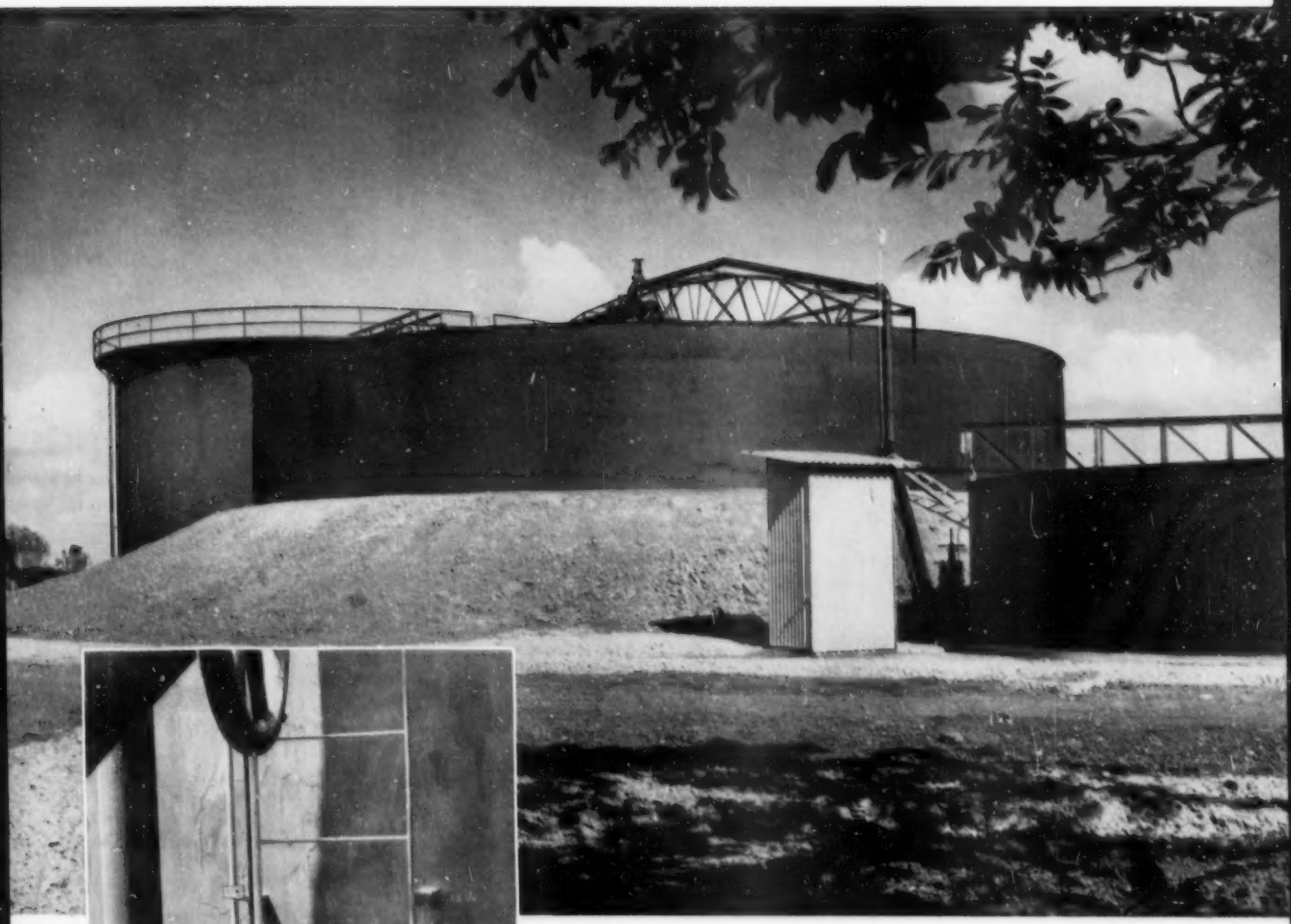

J. B. Dannenbaum, Consulting Engineer of Houston, notes:

"Bitumastic No. 50 given only minor touch-up in 12 years on Solarobic* Process tanks"

The Solarobic Process, developed by J. B. Dannenbaum, uses steel for Imhoff, trickling bed and clarifier tanks at considerable saving in construction costs. Thirty such plants have been installed since 1947: the large illustration shows a new plant at Angleton, Texas, built to serve a population of 10,000. The inset photo shows the excellent condition of the Bitumastic® coatings on the pioneer installation.

Mr. Dannenbaum has standardized on a double thickness of Bitumastic No. 50 for corrosion prevention on both inner and outer tank surfaces. The thick dry-film characteristics of this coating system gives it long life: "In 12 years experience with Bitumastic No. 50 on both steel and concrete, no maintenance other than touch-up has been required," states Mr. Dannenbaum.

Bitumastic protective coatings, with their waterproof coal tar base, have long been popular for sewage plant protection. For more information on their applications in this field, fill out the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Boston, Chicago, New York, Los Angeles, Pittsburgh and Woodward (Birmingham) Ala. In Canada: Koppers Products, Ltd., Toronto.

*Patent pending

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City _____ Zone _____ State _____

uled for collection of refuse, or the evening before.

2.4 Receptacles shall be conveniently located on premises for storage of refuse and maintained in such manner as to prevent creation of a nuisance or menace to public health.

Section 3—Preparation of Refuse for Collection

3.1 Garbage shall be thoroughly and completely drained of all liquids, wrapped securely in paper and placed in a receptacle as described in Section 2 hereof.

3.2 Noncombustible waste shall not be mixed with other refuse when prepared for disposal by incineration.

3.3 Paper shall be secured and properly tied into bundles, or other packages in a manner to prevent any scattering while awaiting or during collection. The bundles or packages shall be of a size and weight to permit ease of handling by one man.

3.4 Combustible waste shall be stored and held in receptacles separate and apart from noncombustible waste when prepared for disposal by incineration.

3.5 Combustible or noncombustible waste of such a nature that it cannot be deposited in a receptacle shall be securely and properly tied into bundles or packages to prevent spilling or scattering. The bundles or packages shall be of a size and weight to permit ease of handling by one man.

3.6 Refuse prepared for collection should be packaged or otherwise assembled in quantities weighing not more than 50 pounds.

Section 4—Business Establishments

4.1 The owner, agent, lessee, tenant, or occupant of any premises whereon a business or industry is conducted shall arrange for the removal of refuse from such business or industry each day, unless sufficient and suitable facilities are provided and used for storage of such refuse until removal of the refuse from the premises.

Section 5—Refuse Disposal

5.1 Refuse shall be disposed of only through use of sanitary landfills established, conducted, operated and maintained in accordance with standards established by the State Department of Health and/or incinerators constructed, operated and maintained in accordance with standards established by the State Department of Health, and code or regulation of the New Jersey Air Pollution Control Commission or other methods of disposal as may be permitted by code or regulation of that Commission.

Section 6—Permits-Vehicles

6.1 The business of refuse collection shall not be conducted in any manner on any public or private place, street or other premises without a permit therefor having been issued by the board of health.

6.2 Vehicles used for the purpose of collecting refuse from receptacles as prescribed by the provisions of this code shall be loaded in such fashion that no part of the contents shall fall, leak or spill therefrom. Each such vehicle shall be adequately and tightly covered as may be directed by the board of health.

Section 7—Nuisance Defined

7.1 The storage, collection or disposal of refuse in violation of any provision of Sections 2, 3, 4 or 5 of this code is hereby declared to be a nuisance and detrimental to public health.

The New Jersey State Department of Health has recommended that this code be adopted without alteration and in full by municipalities within the state.

Oliver Demonstrates New Line of Crawler and Wheel Tractors

FOUR SIZES of crawler mounted, front-end loaders, ranging from ⅝ to 2¼ cu. yd. capacity were displayed and demonstrated recently at "Tractor-Cade" day of the Oliver World Congress on Hawthorn-Mellody Farm near Libertyville, Ill.

Included in the demonstration was the new OC-96 crawler tractor with one-cu. yd. front-end loader and rear mounted scarifier. This special long track loader model has excellent stability for loading heavy materials. Such features as directional power shift, torque converter and the operator's option of using either spot-turn or track counter-rotation increase maneuverability, speed hauling and shorten production cycles.

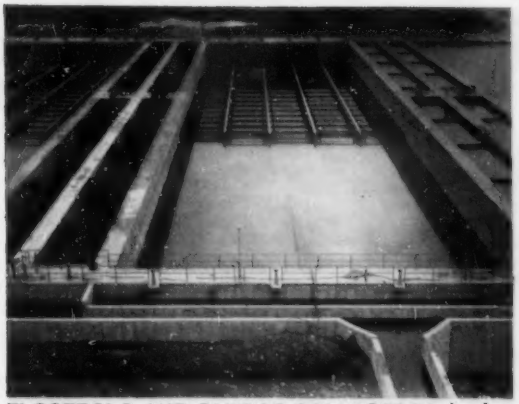
● **WHEEL tractor with backhoe attachment demonstrates its digging ability on a stump removal operation.**

Other crawler models have the new "Spot-Turn" steering, using oil type steering clutches. This feature, along with complete rollback of all buckets results in a shorter overall length, giving these units a great advantage when working in close quarters.

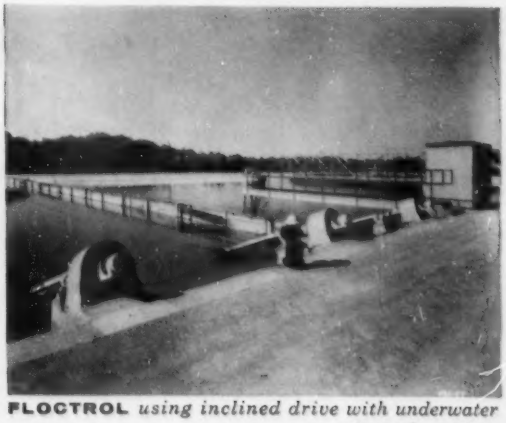
On dirt moving operations, Oliver demonstrated the Model 990 scraper. This is a 7 cu. yd. self-propelled and self-loading scraper with torque converter drive. The unit has an axle load of under 18,000 lbs. when loaded, which makes it well suited for shoulder finishing work, cut and fill operations on rolling areas and on hauls of less than 2500 ft. in length.

In addition, Oliver displayed three sizes of wheel tractors, ranging from 34 to 65 hp, with combinations of front end loaders and rear mounted backhoes. The Model 770 has a ¾-yd. digging bucket, torque converter and power shift, and a reversing, oil type clutch which eliminates the need of shifting transmission gears.

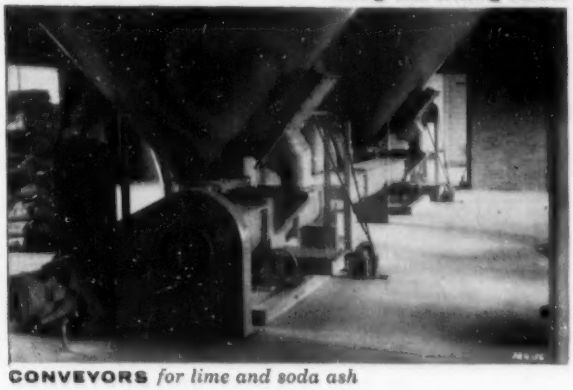
● **NEW addition to the Oliver line of earth-moving equipment, the OC-9 crawler tractor with an Angledozer.**



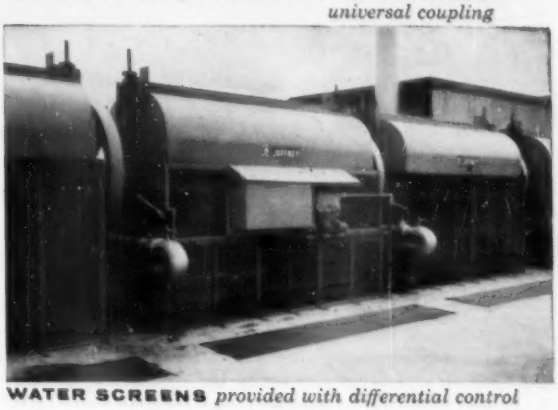
FLOCTROLS AND SLUDGE COLLECTORS *in slow mixing and settling basins*



FLOCTROL *using inclined drive with underwater universal coupling*



CONVEYORS *for lime and soda ash*



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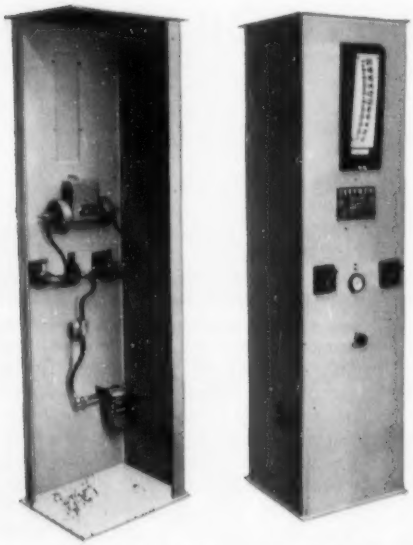

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● "BUCKET SCALING" gutters of chat and asphalt streets in Ft. Worth, Texas. The Massey-Ferguson unit is kept busy at the city yard when not cleaning streets.

Cleaning Streets with a Tractor Shovel

FT. WORTH, Tex., street department officials have devised a new, money-saving way of cleaning chat and asphalt streets, which make up 45 percent of the city's surfaced street system.

The concrete street surfaces are swept with motorized sweepers, but a Massey-Ferguson Work Bull 1001 tractor shovel is used to clean gutters on the 300 miles of chat and asphalt streets. The new system has virtually eliminated the former method of 'pan crew work' in the chat street areas.

The Work Bull is used to 'bucket-scale' the gutter areas. With this rig, one operator, with an accompanying truck driver and laborer, does as much gutter-cleaning in a day as a full manual crew used to do in 60 days. This motorized crew is a trouble-shooting outfit. Each day, the assistant street cleaning foreman and the general foreman make a street tour and with the use of two-way radio, emergency spot jobs are immediately called in.

Other assignments for the rig come from citizen complaints. Especially in rainy seasons, there are many cave-ins along the chatted streets, with mud run-off from sloped parkings, particularly in newer areas where lawns have not yet got up to the point that they can hold the dirt. Complaints have been kept at a low level by use of the tractor shovel unit.

For best results, the loader bucket is used both as a blade and a loader. The operator lowers the bucket to gutter height and then moves ahead, picking up the debris. The two-man crew with the truck that goes along helps as this material is collected—and then the operator dumps it into the truck.

Another assignment this rig handles is at the yard when chat has to be loaded. In the time it would take 12 men to load six trucks, one man with this rig can load three. The unit is also equipped with lights and horn for night operation when necessary, and also with windshield wiper for operation in bad weather.

The general foreman is Otis R. Howell and the assistant street cleaning foreman is William Timmons for the city of Fort Worth.

Work Of A COUNTY TESTING LABORATORY

The testing laboratory of Wayne County, Mich., provides adequate testing facilities for approving highway materials and for approving construction and maintenance work.

No new road surface or structure is placed on a soil sub-surface until a complete study is made of the foundation soil. A soil survey is made and any corrective measures are taken before the work is started. Due to the varied soil conditions in Wayne County, corrective measures are often simple but sometimes very elaborate. In the simplest cases, adequate drainage is the only corrective measure. In other cases, provision of a porous sub-base with drainage is necessary in obtaining an adequate foundation. The most drastic is the complete removal of the existing soil and replacement with a suitable foundation soil.

On concrete pavement projects, laboratory control and testing are handled by a roving inspector who makes daily tests of air content in the fresh concrete. Should the entrained air measured be outside the specification limits, the inspector will recommend the proper amount of air-entraining agent or make small adjustments in the batch proportions of concrete materials.

Field Units

If a project is quite extensive, such as airport runways and taxiways, the Laboratory will equip a field unit to control the concrete mix. This unit will also test the compaction of fills and sub-bases, and has equipment to test the strength of concrete by the flexural method. Coarse and fine aggregates are tested at the processing plants by one of three aggregate inspectors. As a final check, the pavement is cored to verify compliance with plan thickness.

The Laboratory furnishes a plant inspector for all asphaltic-concrete-construction projects. The inspector's duties are to see that all materials accepted on the project meet the specifications by conducting analyses of the mixtures, and checking temperatures and weights of the mixtures placed in trucks. Daily samples of asphalt cement and the mixture are submitted to the Laboratory for future analysis to check against contamination and excessive oxidation of the asphalt cement during plant operations. On several projects, samples of the mix were tested to obtain data in stability of mixes used in various construction projects.

In water and sewage works across the continent . . .

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The men who design and build modern facilities like these know that concrete used in water and sewage plants must withstand severe weathering, wear and corrosive action. That's why they confidently specify and use concrete produced with POZZOLITH . . . for up to 400% greater durability—reduced shrinkage and less cracking—and up to 80% lower permeability. All this adds up to longer, "maintenance-free" concrete life.

POZZOLITH is time-tested and proved. The hundreds of water and sewage works built with POZZOLITH concrete over the past 25 years are evidence that POZZOLITH concrete is superior in performance, in quality, and in economy to plain concrete and to concrete produced with any other admixture.

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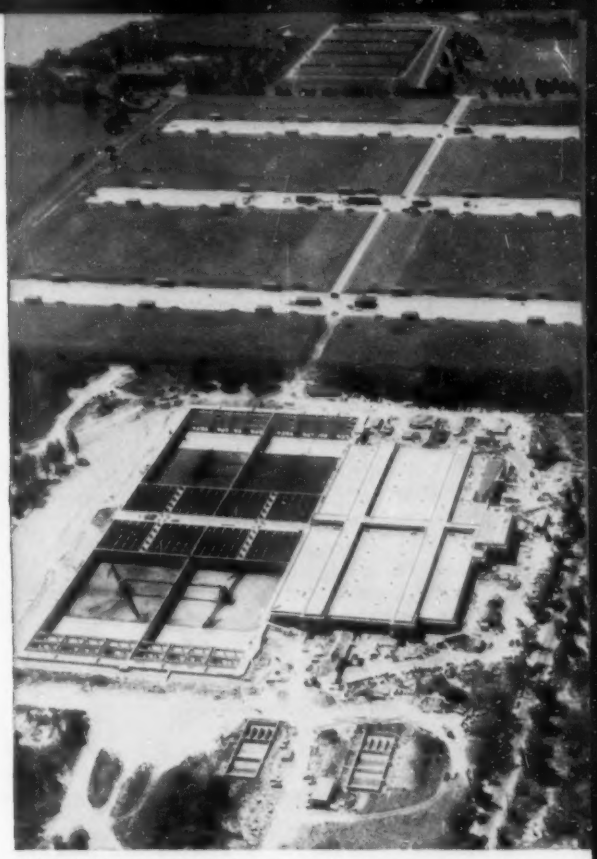

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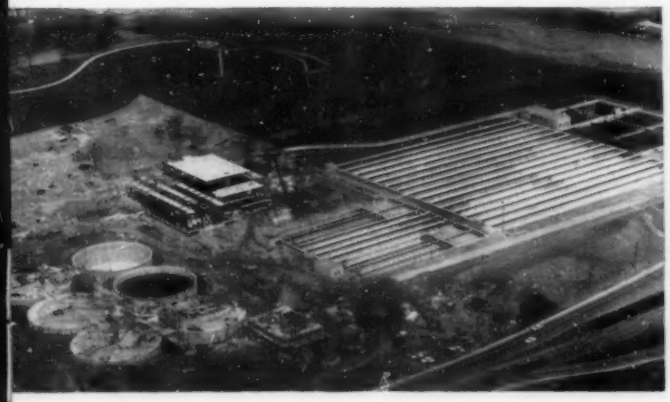

HUMBER SEWAGE DISPOSAL PLANT—Toronto, Ontario • Architect: D. E. Kertland, Toronto • Consulting Engineers: James F. MacLaren Association, Toronto • Associate Engineers: Alvord, Burdick and Howson, Chicago • Contractor: Pigott Construction Co., Inc., Toronto.

KANSAS CITY WATER SOFTENING PLANT—Kansas City, Missouri • Engineers: Burns & McDonnell Engineering Co. and Black & Veatch Engineering Co. • Construction: S. Patti Construction Co., all of Kansas City.

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THE
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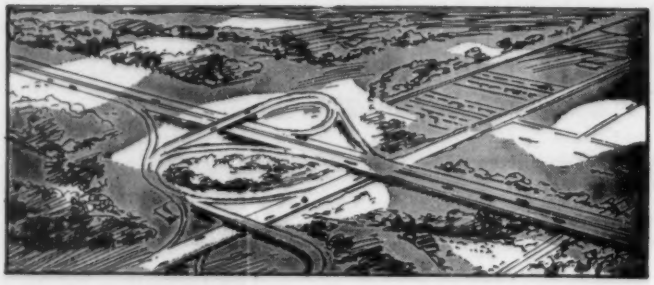


Prepared by **FRANK FORCE,** *Associate Editor*

Smoother Bridge Approaches

Surface irregularities at ends of bridges, a highly undesirable feature on some highways, reduce driver comfort and safety and adversely affect the durability of roads and structures. Bridge approaches on four freeways in the Los Angeles area were investigated concerning settlement. Most of the bridges examined had concrete decks with concrete approaches, and most had concrete aprons about 12 ft. long resting on paving notches. The general requirement for approach fills was a 90 percent relative compaction except for the upper 2 ft., where it was 95 percent. It was found on the inspections where there was coarse granular material, there was no approach patching; where there was cohesive soil 20 percent of the structures had approach patching; and 70 percent of the bridges in areas of silt and soft clay had approach patching. Forty percent of the structures on piles and 38 percent of those on spread footings had approach patching. Except in rare instances, differential settlement at the ends of bridges did not exceed 6 in. More patching was required for closed-abutment bridges than for open-end bridges. Among the measures that may prove useful in reducing surface irregularities on bridge approaches are the following, here listed in order of increasing cost: 1) Use of open-end construction rather than a closed-abutment type, particularly where the underlying soil is poor; 2) specifying early construction of approach fills at the ends of the bridge; 3) use of good backfill material; 4) in the case of asphaltic roads, extending the asphalt surfacing across the bridge deck; 5) surcharging the approach fills; 6) making the approach apron slab about 30 ft. in length to eliminate sudden grade breaks by bridging depressions near the ends of the bridge; 7) replacing poor material with good in fill construction; and 8) lengthening the bridge to reduce the height of the approach fills.

"Smoother Bridge Approaches." By Charles W. Jones, Supervising Bridge Engineer, California State Div. of Highways, Sacramento, Calif. *Civil Engineer,* June, 1959.

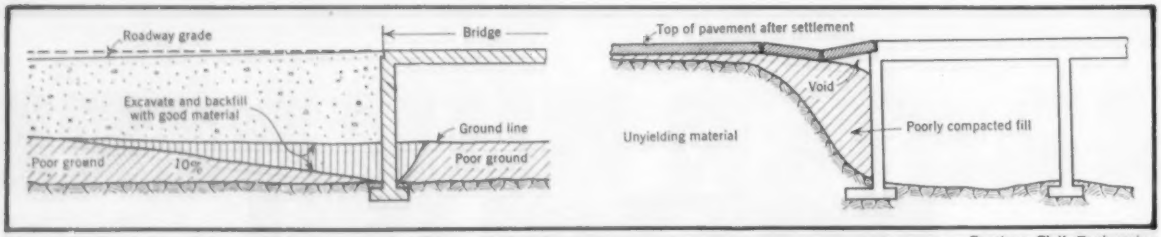
Design Considerations in Planning Street Lighting

In planning new street lighting or modernizing old systems here are the problems to be resolved: 1) What are the specific bounds of the area to be lighted; 2) what standard of illumination shall be provided; 3) what type of lighting source should be used; 4) shall underground or overhead distribution be used; 5) what type of distribution system; 6) what type of controls should be used; and 7) what type of pole shall be selected? The first step in detailed plan preparation is a field survey of the streets to be served. This survey should include the location of all obstructions between the sidewalks and the curb; location of any underground openings; and location of driveways and other topographic data. After this information is plotted, a tentative location of lighting units is established. A template to the scale of the drawing is frequently used to show the light coverage from the trial locations. The circuitry must be defined and established to provide a balanced load on the transmission lines. On overhead circuitry considerable attention must be given to span length and the minimizing of street crossings. On underground circuiting, a location must be selected for the cable and for conduit which will minimize interference with other underground utilities and will provide the least amount of pavement and sidewalk cutting.

"Basic Design Considerations in Planning Street Lighting." By James P. Murphy, Crawford, Murphy & Tilly, Consulting Engineers, Springfield, Ill. *Street Engineering,* June, 1959.

Uses of Asphaltic Materials in Highway Pavements

Asphaltic residual oils, asphalt cements, cut-back asphalts and emulsified asphalts are available for paving purposes. Residual asphaltic oils are quite effective as low cost dust palliatives and light surface



Courtesy Civil Engineering

● **TWO conditions which may cause depressions at bridge approaches. A method of avoiding settlement is shown at left.**

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- Exclusive bucket position indicator.

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- Superior reach, digging depth, undercutting, truck loading with all models.
- Many buckets; unmatched capacity.
- Full-power 185° swing.
- No delays, no wandering in swing system.

These of course are only highlight features. See Ford, try Ford at your dealer's, or for detailed specifications write Industrial Tractor and Equipment Department, Ford Motor Company, Birmingham, Michigan.

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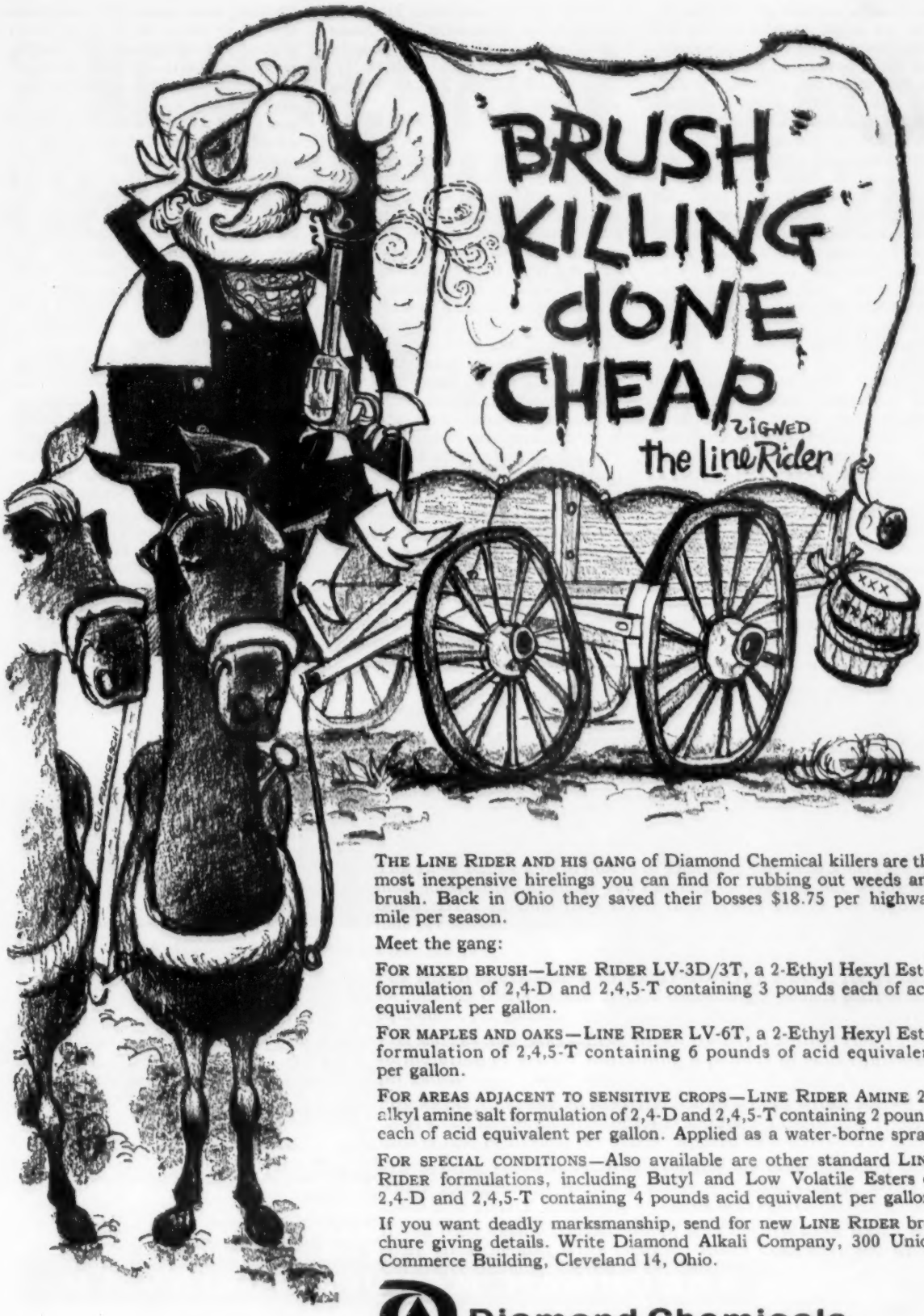

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Diamond Chemicals

treatments. Asphalt cements may be, and are being, used in conjunction with bituminous penetration macadam bases, pavements and seal coats. In such instances, soft AC's of 120-150 and 200-300 penetration are used. The AC must be hot, at least 325°F and the aggregate dry if good penetration and coating of the aggregate is to be attained. Asphalt cements of these grades may also be used for tack or prime coats under similar circumstances. In the use of asphalt cements in hot plant mixes, they will generally provide high type, heavy duty, durable pavements. Cut-back asphalts may be used in the various forms of applications: Dust palliatives; prime coats; tack coats; penetration macadams; seal coats; road mixes; and cold laid plant mixes. Emulsified asphalts may be effectively used with damp or wet aggregate in road mix, soil stabilization, penetration macadams, seal coats and cold mix operations. They are not used in conjunction with hot mix operations. In using bituminous mixtures, know your materials and select them intelligently to conform to the specific construction or mixing methods, looking toward the particular service the pavement must perform.

"The Uses of Asphaltic Materials in Highway Pavements." By Ladis H. Csanyi, Professor in Charge, Bituminous Research Laboratory, Iowa State College. PUBLIC WORKS, July, 1959.

A Low-Cost County Bridge

Building economical bridges in San Benito County, Calif., is quite a problem with the difficult and varied foundations, nature of the streams and lack of money. The Murphy Road bridge over the Tres Pinos Creek is an example of an economical solution to one of these bridge problems. All steel, except reinforcing bars for the concrete, was bought on the open market at from 2 to 3¢ per lb. Scrap steel was used for piling, girders, rail posts and miscellaneous items such as shear developers and bearing plates. The pilings were 60 to 90 lb. used railroad rail in 30-ft. lengths. Composite beam action was developed by casting a flat bearing plate into the pier cap and the bottom flanges of the steel girder were welded to it. The bottom flange at the support was the only fixed part of the span. A gap of from ½ to 3 in. was left between abutting beams and the expansion joint material separated abutting deck spans. The wingwalls are piling driven to 15-ft. to 20-ft. depths depending on the length wanted above the ground. A single shot armor coat was applied on the deck the day after pour for a cure and non-skid surface. Asphaltic emulsion was used at the rate of 0.2 gal. psy and covered with 20 lbs. psy of screenings. The total cost of this 120-ft. bridge was $22,500.

"Engineer's Ingenuity Provides a Low-Cost County Bridge." By Robert Saxton, Deputy County Engineer, San Benito County, Calif. *Rural Roads*, May-June, 1959.

Engineering Geology Evaluation

There is a rapid approach by which much needed geologic information can be given the engineer for preliminary planning, by means of a quick, generalized interpretation of the soil, bedrock and terrain conditions. An engineering geology study of this type provides an engineering geology map, a description of the map units and a relative cost evaluation. The map shows the distribution of the different types of soil and bedrock materials. The map legend designates the excavation characteristics, ranging from soft to hard. Each map unit gives some sig-

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8 NEW BAUGHMAN SAND and CINDER SPREADERS TO CITY OF BUFFALO

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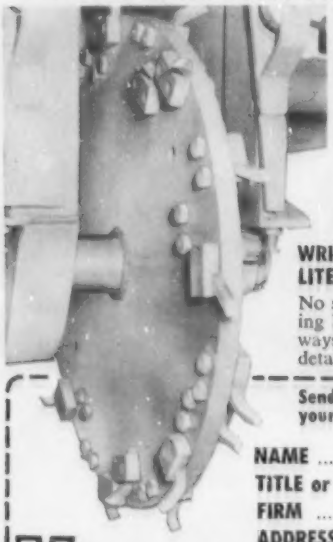
You'll never know how easy stump removal can be, unless you've seen the Pow-R Stump Cutter in action. Here's the machine that has simplified this expensive, back-breaking, laborious job in cities, parks, golf courses and cemeteries all over the country. A one-man operation . . . a real time saver . . . a real labor saver! The Pow-R Stump Cutter removes the largest tree stump — rips it to shreds down to a depth of 10" below the ground — all in a matter of minutes. "Removed 44 stumps in 8 hours with the Pow-R-Stump Cutter" . . . is the report from one city recently.



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nificant engineering characteristics and these include terrain, excavation conditions, subgrade and foundation conditions, construction materials, stream crossings, erosion and drainage and vegetation. The type of information given for these two map units has proved extremely useful for projects in the preliminary planning stage. It also can be used in the evaluation of relative costs. The map can also be made still more comprehensive by showing directly (or by transparent overlay) roads, contours, streams and rivers, towns and villages, railroads, airports, canals, gravel pits and rock quarries, and any other topographic features. Limitations of the map are where there are large land areas involved, where soil and bedrock conditions are complex, where published data are inadequate, unreliable or nonexistent, the use of photogeology and other techniques may be necessary to prepare an engineering geology study. Detailed field investigation and laboratory testing are still required to obtain information for final design at specific sites.

"Engineering Geology Evaluation for Preliminary Planning and Site Selection." By Allen H. Nicol, Consulting Engineering Geologist. *Consulting Engineer*, June, 1959.

Sand and Arid Climate Pose Road Building Problem

Imperial County, Calif., is consistently dry, averaging 3 in. of rain each year. The county road system totals 2,200 miles, on which are about 5,000 structures. It was the county's job to build a paved road extending for some 15 miles across farmland and desert. A total of $800,000 was provided in the budget for the project. The nearest water to the area was 3 miles away and the county let a contract to supply 36,000 ft. of 6-in. pipe on lease for 3.8¢ per ft. per month. This was connected to a 4-stage jet pump equipped with an industrial engine at the source. An additional lift pump was later installed several thousand feet away to carry the water head right along as the construction crew moved ahead. Bulldozers were rented by the county at the rate of $15 per hour and when the job was done, 1,550,000 cu. yd. of sand had been shifted with a unit cost of 14¢ per yd. The movement of the sand by wind is a big problem and this was solved by oil-coating the 6-ft. berms and applying oil to the slopes. Two-way radio telephones were installed in the pick-ups and survey wagons for

ONE MAN... your TRUCK DRIVER is your ENTIRE CREW

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STĀ-BILT Century SPREADERS

• All STĀ-BILT Century SPREADERS* are operated hydraulically by finger-tip control in the truck cab. That's a big economy, for spreaders which require an additional man in the truck body (a dangerous position) to shovel bulk materials or to dump bags, cost at least $16 to $18 a day extra.

There's a STĀ-BILT Century model for virtually every spreading need — ice control, sealcoat work and for soil stabilization. Several units are multi-purpose so you have a longer period of productive, cost-saving work.

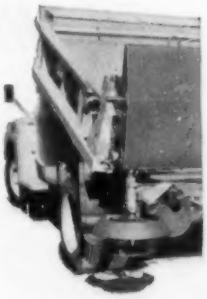
In addition to the STĀ-BILT Century Spreaders shown below, there is the SHY-34, a practical, low cost sealcoat unit which spreads a metered, clean margined mat 24 inches to 9 feet in width. Frequently the SHY-34 spreads chlorides in salt stabilization.

Then there's the Century HY-8, a low cost unit which is able to spread chlorides for ice control in extremely sparse amounts. It too, is popular in soil stabilization.

Except the hopper type Century JUNIOR

The Century HY-4 is highly versatile. Equipped with a spinner the HY-4 spreads sand or chips from 24 inches to 40 feet for ice control.

In summer for sealcoat work, the spinner on the HY-4 can quickly be replaced by the channeled tray (above). With the tray the HY-4 spreads sand, stone, chlorides (for soil stabilization) and all types of aggregates up to 1½ inches.



Century Model HY-4LCT has the spinner and circular deflector mounted at the left hand corner of truck body. This allows truck to travel in proper traffic lane and spread on center line for dispersion of materials by traffic.

Would you like to learn more about all the STĀ-BILT Century Spreaders? We'll be glad to give you complete details.

SEAMAN-ANDWALL CORPORATION
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communications. The county employs 110 men and they can handle the full job of road work. To handle the maintenance jobs there is available 25 8-yd. dumps, 15 water wagons, 16 motor graders and 6 draglines.

"Sand and Arid Climate Pose Special Problems for County." By Tom Read. *Better Roads*, May, 1959.

Permanent Pavement on a Long Range Plan

Great Bend, Kans., has 78 miles of streets, of which all but 160 blocks are hard surfaced. Since 1950, the paving of streets has been a major project and concrete, hot and cold mix asphalt and some brick have been used. The city first paved the streets by passing resolutions unless residents brought in sufficient protests to block them. The next method used was paving by petition with the resolution method being used for single unpaved blocks between paved sections. Today there are six different hard surfacing types available. They are as follows: 1) 6-in. reinforced concrete; 2) 5-in. plain concrete with 2-in. asphalt surfacing; 3) 7-in. rock base with 2-in. asphalt surfacing; 4) 6-in. asphalt stabilized base with 2-in. hot asphalt surfacing; 5) 6-in. waterbound stabilized base with 3-in. asphalt surfacing; and 6) 6-in. soil cement base with 2-in. hot asphalt surfacing. Permanently improved streets are divided into residential, secondary, arterial and major trafficways. The Kansas State Legislature has passed a statute used by Great Bend that provides a more equitable sharing of costs of extra-wide streets. It provides that when the governing body deems it reasonable, the cost of a paving project can be shared partly by the adjoining property owners and partly by the city at large. Paving on wide streets in residential areas will be charged on the basis of 31 ft. to the property-owners and the remaining amount will be paid out of the city's general fund.

"We Pave for Permanence and to a Long Range Plan." By Herbert Callon, City Engineer, Great Bend, Kans. *The American City*, June, 1959.

County Engineer and the Consultant

With the growing importance of local roads and streets maintained by counties, the job of the county engineer has become more difficult and time-consuming. Consultants are playing a big part in helping the county engineers. Some of the ways in which the consultant can provide this help are: 1) By doing the once-in-a-while job; 2) by providing the services of specialists which the county engineer cannot be expected to have; 3) by stepping in when an emergency occurs; 4) by providing an engineering report, either short or long range; and 5) by providing the personnel to speed up preparation of plans when deadlines become important. Covered in this article are examples of bridges designed by a consultant for several New Jersey Counties and other jobs designed by this consultant.

"The County Engineer and the Consultant." By Walter L. Braybrooke, Chief Highway Engineer and Abba G. Lichtenstein, Principal Structural Engineer, Goodkind & O'Dea, Consulting Engineers, Bloomfield, N. J. PUBLIC WORKS, July, 1959.

Use of Dynamite

Since its development in 1866, dynamite has become a standard and essential tool of construction. Improvements in blasting techniques and the discovery of new applications continue to increase its importance. Through imaginative and

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skilled application of explosives, the blasting specialist can save time, money, even lives, in municipal, industrial and utility work. The more imaginative and flexible an experienced explosive's expert is, the greater his value. He will get maximum results from minimum loadings, develop tighter control of vibration, concussion and debris, and in many instances will develop applications new to the field. A new type blasting machine can fire 1,200 caps at a time and the concussion and vibration can be controlled by the use of millisecond (MS) delay caps. Specialized equipment should be used to carry the explosives and detonating machines. An experienced powder man should be carried on a contractor's force at all times.

"Dynamite + Imagination & Experience = Economy." By William F. Hallstead. PUBLIC WORKS, July, 1959.

Other Articles

"Surviving **Covered Bridges** in Illinois." By Harry L. Spooner, Better Roads, May, 1959.

"New Building Houses Maryland Forces." Maryland State Roads Commission building first of three state buildings in former slum area in Baltimore. By Charles T. LeViness. Better Roads, May, 1959.

"What's Wrong with **Consulting Engineers?"** Consulting Engineer, June, 1959.

"Electronic Computer Helps Engineers in the Field." Computer computes plan quantities, helping contractors on many construction jobs. Highway News, May-June, 1959.

"Rubber Roads Require Little Maintenance." By John J. Zablotny, Supt. of Highways, Town of Cheektowaga, New York. Public Works, July, 1959.

"Cleaning Freeway Signs." The large **signs on freeways and expressways need cleaning** to show their brightness and visibility. By E. T. Telford, Assistant State Highway Engineer, District VII, State Division of Highways, California Dept. of Public Works. Public Works, July, 1959.

"How Engineers Are **Applying Electronics to Highway Calculations."** Roads and Engineering Construction, May, 1959.

"Copies, Copies, Copies!" This article covers the what, where and how the **thousand and one reproduced paper items** used by the Texas Highway Department, from booklets to engineering plans, are prepared. Texas Highways, May, 1959.

"How the World's Longest **Vertical Lift Bridge** Will Work." By Alfred Hedefine and Thomas R. Kuesel, Parsons, Brinckerhoff, Hall & MacDonald, Consulting Engineers. June 11, 1959, Engineering News-Record.

"Fly Ash as Bulk Fill." A trial embankment of power station fly ash has been built at Willington and a series of tests carried out to establish its properties and suitability as a material for bulk fill are reported. Contractors Record and Municipal Engineering, May 27, 1959.

"Dynamiting Did It Where Drop Ball Was Out of Bounds. This job is a reminder that fractional-stick shots with mats can do remarkable things in close quarters, in the hands of the experts. By William F. Hallstead. Roads and Streets, June, 1959.

"Construction of Joints in Concrete Pavements." Joints are an important part of the pavement and are designed to function in such a way as to control cracking and prevent excessive stresses from development. They must be built properly if they are to do the job and not be a source of trouble to the riding public and the maintenance engineer. By Gordon K. Ray, Manager, Highways and Municipal Bureau, Portland Cement Association. Modern Highways, June, 1959.

"Louisville Extends Its **Signal Synchronization."** City has all signalized intersections either traffic actuated or tied into some interconnected system. New super master controller will unify several systems to further synchronize traffic in the central area. By W. F. Watkins, Director of Traffic Engineering, Louisville, Ky. Street Engineering, July, 1959.

STANDARD STEEL "S-J"
Maintenance Distributor

for VERSATILITY — EFFICIENCY — ECONOMY

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Standard Steel S-J Maintenance Distributor, designed specifically for jobs where the use of bigger equipment is costly and impractical, can be moved rapidly from one location to another for patching, shoulder repair or construction of secondary roads . . . It is equipped with suck back spray bar which permits closing of the discharge valve and pulling back all surplus material in the spray bar and piping for quick cleaning . . . All piping and valves are flanged to permit easy repair or replacement . . . The draw off valve is on curb side for safety . . . and coilless self-generating burners are standard equipment as well as a Viking special asphalt pump which can be completely drained, eliminating the necessity for thawing when the unit is started cold. Write for complete details on Model S-J.

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PRICED TO FIT THE MOST MODEST BUDGET

This new Series DF 1 "Earth-Master" digs straight, clean holes—up to 20" in diameter and 10' in depth—in practically any type of soil. It digs close to poles, fences and buildings, reaches areas inaccessible to "fixed position" units, swings out of the way to permit unrestricted use of the derrick and can be easily transferred to another vehicle.

Like all portable diggers in the "Earth-Master" line, the DF 1 is designed for use with a "live boom" hydraulic derrick, such as the Series PM 1 "Pole-Master" shown. Down pressure which can be applied with the derrick teams up with natural feed of the auger to facilitate digging in extremely hard soil.

The DF 1 is powered by a hydraulic pump driven by the truck engine. Rotation is accomplished by a reversible hydraulic motor through a chain and sprocket assembly. Control lever, installed next to derrick controls in right rear compartment of body, is available with built-in engine speed regulator.

Standard full flight auger, with Pengo head having replaceable points, can be furnished in sizes from 9" to 20" in diameter.

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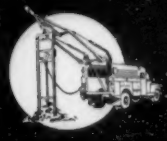
SERIES EM-1 "Earth Master" digs holes from 9" to 20" in diameter, as deep as 9'4" vertically or at various angles. Auger is guided at all times, feeds and rotates under power.

SERIES EM-2 "Earth Master" handles the work of a "fixed position" boring machine. Guided auger feeds and rotates under power; digs straight clean holes up to 10" in diameter . . . up to 10'6" deep, vertically or at angles.



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STREAM LIFE and the POLLUTION ENVIRONMENT

by
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and
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of the Robert A. Taft Sanitary Engineering Center, U.S. Public Health Service

Illustrated in Full Color

An outstanding article of long-time reference value and closely tieing in with the water conservation programs of the country.

Includes a series of elaborately colored charts for training sanitary engineers and supporting scientists. Graphically portrays the relationships of the various factors of stream environment under conditions of pollution and recovery. The eight illustrations are accompanied by text matter clearly explaining each phase of stream degradation and recovery. This article can serve as a valuable self-instruction medium. It is of a caliber that insures a long and active reference life for this reprint.

Written by two of the foremost authorities in the field. Dr. Bartsch is assistant chief for Special Technical Services of the Water Supply and Water Pollution Research Program of the Robert A. Taft Sanitary Engineering Center. Dr. Ingram is in charge of Biological field investigations for the Water Pollution Control operation of the same program at the center.

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Low Cost Financing for Sidewalk Construction

A finance-credit plan for a sidewalk construction program has been worked out by North Miami Beach, Fla. As a result, the net interest rate will be between 0.25 percent and 3 percent.

According to the plan, the city will continue to place time deposits with a local bank and will receive 2¾ percent interest on its Certificates of Deposit. In the past, the Certificates of Deposit had drawn only 1 percent interest.

Against this arrangement the bank will extend all the necessary credit to pay for the sidewalk construction project, estimated to be under $350,000, repayable over a period of five years with interest starting at 3 percent per annum and rising half a point each year. The city has the right to pay off the certificates of indebtedness to be issued under this agreement, in reverse order, so that those bearing interest at 5 percent may be paid off during the first year, creating further savings for the city.

The debt will be paid off out of the money received from the sidewalk improvement assessments secured against collections of the utility tax revenue. It was estimated the entire debt will be repaid in less than three years although the terms call for a five-year amortization.

The outstanding feature of this finance-credit plan is the fact that the city has been paying interest on its borrowings from a low of 4¾ percent to a high of 6 percent. The new plan will enable the city to borrow money in the future, when needed, at a lower rate.

• • •

Township Snow Control

(*Continued from page* 119)

machine shop and foundry where they are completely overhauled, repaired and painted. After the '58 storms the plows were in pretty rough shape but a thorough renovation put them back in good working order. Because of storage demands the plows are stored behind the road garage, but this year they will be treated with an all weather preservative to eliminate rust and weather wear; they are also covered with water repellent tarpaulins for extra protection.

After each storm the Tarco's are demounted and thoroughly cleaned, inspected and tested to be ready for their next use. This is most important for salt and calcium accumulation on the spreaders and the motors can cause clogging and corrosion that will in time reduce their effectiveness. Also, Banox is used in the salt mix to help prevent corrosion on the machines. The other snow equipment is included in our regular maintenance program and serviced by one of the road crew who also acts as mechanic to our equipment.

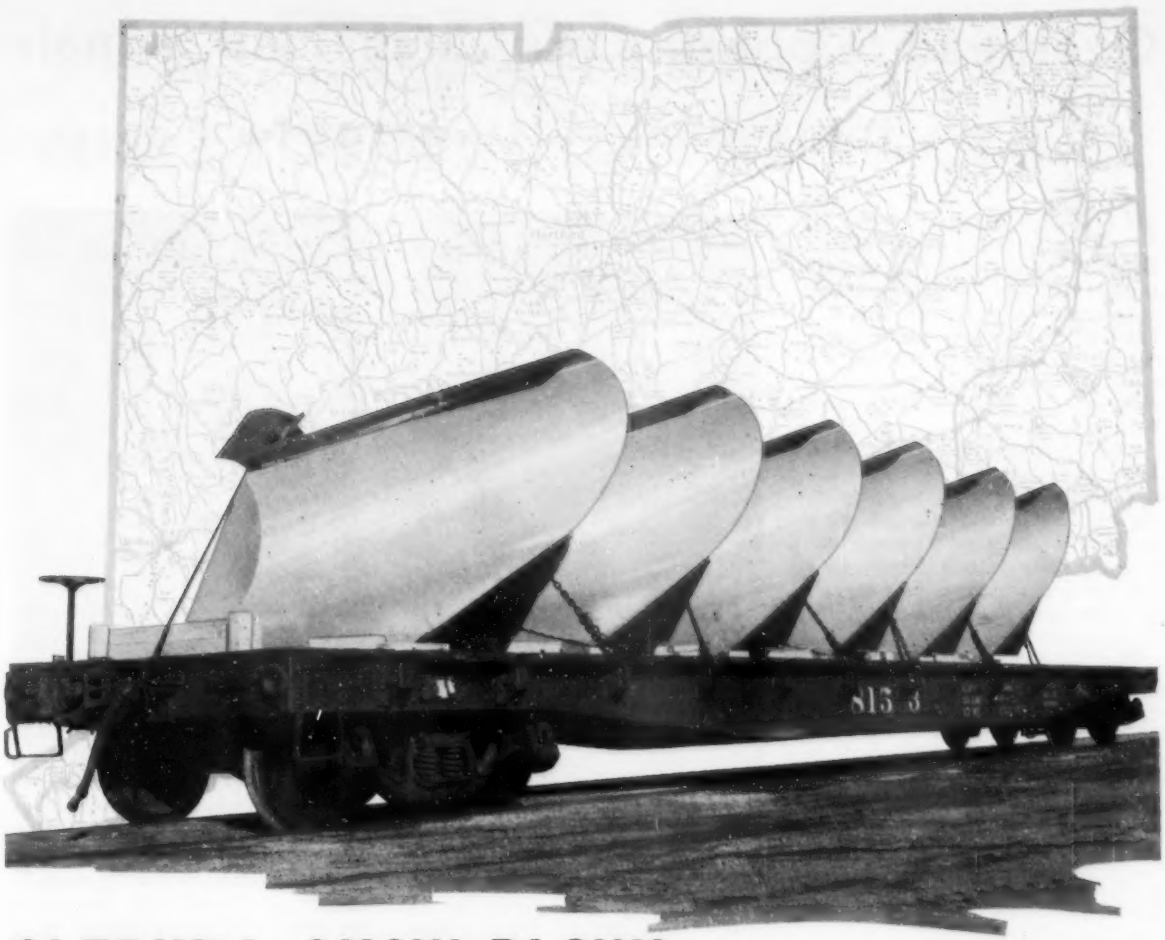
All the rolling equipment has fitted chains with two extra pairs to cover the trucks. A stock of links is kept on hand for on the spot repairs and after extensive use a day or two is spent in the shop with the crews repairing and resetting the chains.

Public Information

The public is made aware of our program early in the season when pictures of new equipment or refurbished equipment are released to the local paper along with stories about the general snow control program. During the winter, periodic reports are released giving the amount of miles traveled by the trucks, the materials used and any interesting or unusual incidents that would make good "feature" material. The revamping of our grader cab and the purchase of the V-plow got excellent coverage and told about our snow program with pictures and data.

Although our program is set up to achieve full measure under existing circumstances, the Board of Supervisors is hopeful that following a long range replacement program of new trucks and plows, an additional material spreader to complement the Tarco's and an additional truck for snow use can be added to the township roster of equipment. If the latter occurs, we plan to equip our Tarco's with in-cab controls and reduce the operation to one driver and one laborer.

We are also in need of radio communications for the road crews. This is even more vital considering the nature of rural roads and areas in Bensalem. Many times at night a truck patrolling long rural roads has a breakdown or mechanical difficulties and will be isolated for as long as two hours until a member of the crew can get to a phone to call in or until the road foreman, checking the area, finds them. The township is now in the planning stage for a central communications system in our soon-to-be-erected township building and we are hopeful that a frequency for the road crew will come out of this.



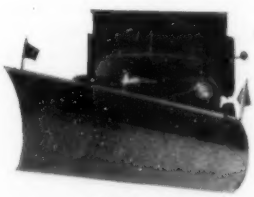
GLEDHILL SNOW PLOWS are Connecticut Bound!

Connecticut's Guarantee — never to be snowbound again!

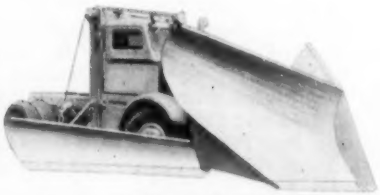
Above, are six V-type Gledhill Snow Plows, part of a large order of fifty-six units, headed for the great State of Connecticut. And you can rest assured that the Connecticut Highway Department has fifty-six good reasons why their roads and highways will never be snowbound again.

It must be mighty reassuring for Connecticut motorists, and the Highway Department alike, to know that they are amply stocked with America's finest snow plows to meet any kind of crisis that old man weather happens to deal out.

GLEDHILL makes a wide variety of Snow Plows for every need, for every requirement



• Taper Plows



• "V" Plows with Wings

• Straight Plows

• Right-V-Left

GLEDHILL ... *America's First Choice in Snow Plows*

THE GLEDHILL ROAD MACHINERY CO. GALION, OHIO

Overhead Supports Carry Signs and Signals for a Busy City Street

IN ITS effort to combat increasing traffic volumes, the Department of Streets, Philadelphia, Pa., has recently installed overhead signal supports on Arch Street. This is a heavily travelled downtown artery which had been bogged down with cars, trucks and trolley cars. Business suffered and properties were deteriorating.

When trolleys were replaced by buses, the street was resurfaced and new mercury vapor lighting was installed. Traffic was changed to a one-way movement except for morning hours, traffic lines were painted and overhead lane signals were installed to channel the traffic flow.

The all aluminum tapered supports were spaced from a minimum of 240 ft. to a maximum of 600 ft. The distance of the supports from intersections ranges from 70 ft. to a maximum of 235 ft. The minimum road clearance for the signals is 14½ ft. There were 12 overhead lane spans installed.

Ten of the structures were 40 ft. c to c and two were built 56 ft. c to c. They were designed to carry traffic control assemblies and up to 50 sq. ft. of signing. The wind load design was 40 lbs. per sq. ft. to withstand winds in excess of 100 mph.

The shafts on the 40-ft. span structures were 8-in. at the bottom and tapered to 6⅝-in. at the top. The shafts are made of ¼-in. 6063-T6 aluminum alloy and are set in transformer bases. The bases are fastened to the footing by four 1-in. x 40-in. hot rolled galvanized steel anchor bolts, hooked on a 15-in. diameter bolt circle.

The horizontal beam is made in 2 parts with a field joint at the center. The middle 10 ft. is 8-in. and the ends taper to 6⅝-in. It has a 3/16-in. wall thickness made of the same alloy as the shaft. Ends of the beams are rigidly connected to the shaft by means of Type 356 cast aluminum alloy flanges. The 45° joint is bolted together with eight ½-in. Type 304 stainless steel bolts. These rigid joints cut down the deflections of the horizontal beam.

The shafts of the two 56-ft. structures are 10 in. at the base tapering to 8 in. at the top with a 3/16-in. wall thickness. The horizontal beam is 10 in. at the center (for 20 ft.) tapering to 8 in. at the ends. The wall thickness is the same as the shafts. The shafts end in a shoe base with a 4-in. x 6-in. hand hole. The shaft is bolted by four 1½-in. x 54-in. hot rolled galvanized steel anchor bolts on a 16-in. diameter bolt circle.

● **NEW pavement surface, mercury vapor lights and installation of overhead sign and traffic signal supports have rejuvenated this street in downtown Philadelphia.**

Wire inlets and outlets were built into the structures as required by the city and facilities for wiring from either end are provided.

Marbelite square lens type traffic signals are used with horizontal mounting and are controlled by a clock mechanism. The maximum traffic flow is between 7 and 9:30 am and between 4 and 6:30 pm.

The aluminum supports and beams were furnished by Pfaff & Kendall and the contractor for the job was Centrone Construction Co., Wynnewood, Pa.

Work of Electronic Computer Center of Georgia Highway Department

Useful figures on the miscellaneous activities of the Electronic Computer Center of the Georgia Highway Department have been issued by M. L. Shadburn, State Highway Engineer.

The bridge department processed 524 problems in 1958 and 116 problems in January and February of 1959 for a total of 640 problems, which, as estimated by the Bridge Engineer, would have required the employment of 13 engineers at an annual cost of $100,000. The Computer Center found it not economic, (because of the insignificant time consumed) to maintain problem costs. Consequently, no charge was made for this work.

The roadway plans department processed 1239 traverse problems in 1958 and 439 such problems in January and February, 1959, for a total of 1678 traverse problems during the 14-month period. This work was performed at the convenience of the computer department and no charge was made. However, the submitting units estimated it saved 3563 engineering man-hours.

The aerial survey department processed 20 traverse problems totaling 502 miles. These problems required: 1) The correction of slope

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Dodson's Digest

Wash my dust

Sorg Jensen's broad, tanned face split into an impish smile when he saw my car pull up to the construction shack near a new highway his contracting firm was building. "Come to sell me some more Calcium Chloride, Dod?" he asked, winking as I strode toward him.

"Don't have to," I motioned toward some bags stacked nearby. "But when I think it took me nearly two years to convince you to use it for summer concreting . . ." I just shook my head.

Without warning, a giant road scraper rumbled by us on the haulage road, engulfing us in a blanket of dust. Choking and sputtering, Sorg yelled angrily to his foreman, "I TOLD YA TO WET IT DOWN, AL!"

I started to brush Sorg off. "If he was any kind of foreman, he'd lay that dust once and for all instead of wetting it down temporarily," I muttered.

"How ya mean?" Sorg asked bristling.

"Take that scraper," I said. "Tests show that it averages slightly over eight miles an hour, producing about forty cubic yards an hour. But on a properly graded, dustfree haulage road it can average fourteen miles an hour, haul about sixty-two yards an hour."

Sorg stomped off. I could see him talking heatedly to his foreman and motioning toward the Calcium Chloride.

Suddenly a voice behind me said, "Did I make enough dust, Mr. Dodson?"

"Plenty," I replied to the driver, laughing. "I knew Sorg would be a pushover when I mentioned how dustproofing would speed up his work. He reacted faster than *I* could say, 'Calcium Chloride'!"

—L. D. Dodson

P.S. For timely tips on how to eliminate dust problems with Wyandotte Calcium Chloride, send for a copy of our free leaflet, "How To Stop Bothersome Dust." *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE

Table 1—Earthwork Quantities Computed During the 14-Month Period Ended February 28, 1959

Period	Mileage	Costs		Time In Mins.	
		Total	Per Mile	Total	Per Mile
For Design Purposes					
For Year 1958	1,319	$20,414.25	$15.48	106,277	81
Jan. & Feb., 1959	286	3,788.89	13.25	16,985	59
14-Month Period	1,605	$24,203.14	$15.07	123,262	77
For Final Pay Purposes					
For Year 1958	736	$11,855.77	$16.11	96,215	130
Jan. & Feb., 1959	213	2,484.09	11.66	23,362	110
14-Month Period	949	$14,339.86	$15.11	119,577	126
Total of Design and Final Pay Together					
For Year 1958	2,055	$32,270.02	$15.70	202,492	99
Jan. & Feb., 1959	499	6,272.98	12.57	40,347	81
Grand Total	2,554	$38,543.00	$15.09	242,839	95

NOTE: The above costs and time include labor and equipment used on the 413 projects processed.

NOTE: Cost studies, by the Design Department, indicate the cost, to compute manually a mile of earthwork quantities to be $105.02 and to require 56½ man hours.

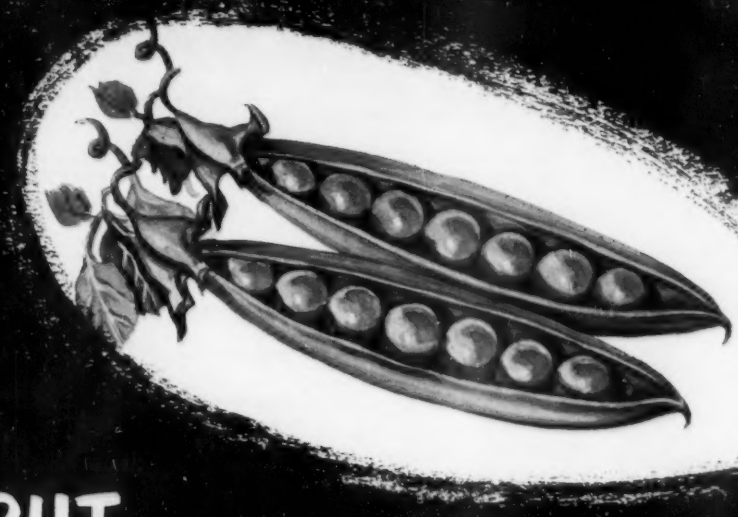
measurements by adjusting the field notes to allow for variations in temperature, variations in local elevation from sea level, and to correct for the true length of chain; 2) the adjustment of angulation notes to determine the precise angle required to establish the direction of lines for the horizontal control system. With the above adjustments, together with the bearings of a traverse, the closure is computed.

The soil survey department using the Swedish Slip Circle method have analyzed the soils on six intertate projects to determine their stability. The analysis determines the width of rights-of-way necessary to obtain safety from earth slides in both cut and fill sections.

County Asphalt Plant Produces 850 Tons per Day

Working a steady 8-hour shift, this asphalt plant owned by Gregg County, Texas, produces 850 tons per day. A Model 1600 20-ton Manitowoc crane equipped with a 1¼-yd. clamshell charges the Barber Greene asphalt plant. The crane is also used as a dragline for county road work when not needed at the asphalt plant site.

They LOOK alike...



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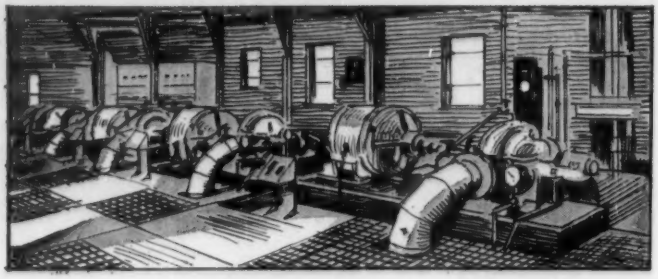
THE WATER WORKS DIGEST



Prepared by **ALVIN R. JACOBSON, Ph. D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Corrosion Research

Occasionally water supplies are found to be relatively non-corrosive to iron and steel. The authors conducted a series of investigations to determine the influence of chloride, sulfate, bicarbonate and mixtures of chloride with bicarbonate and sulphate with bicarbonate on the corrosion of steel. The cation was restricted to calcium. The corrosion tests were made in small-volume batches by inserting small test panels in 1-liter portions of the synthetic waters. The results obtained at anion concentrations up to 100 mg/L were recorded in a series of interesting graphs shown in the article. Several features of these data are noteworthy. First, the distilled water was only very slightly corrosive under the conditions of exposure. Second, the addition of bicarbonate to the distilled water reduced the corrosion to an even lower level. Third, the corrosive attack was very sensitive to chloride even at very low concentration levels. Finally, the sensitivity of corrosion to sulfate is even more pronounced than to chloride. The presence of chloride or sulfate either disrupts or prevents formation of a protective oxide film, sulfate showing a more pronounced tendency to interfere with the protective film than does chloride.

"Influence of Water Composition on the Corrosion of Steel." By G. B. Hatch and O. Rice. *Jour. A. W. W. A.*, June, 1959.

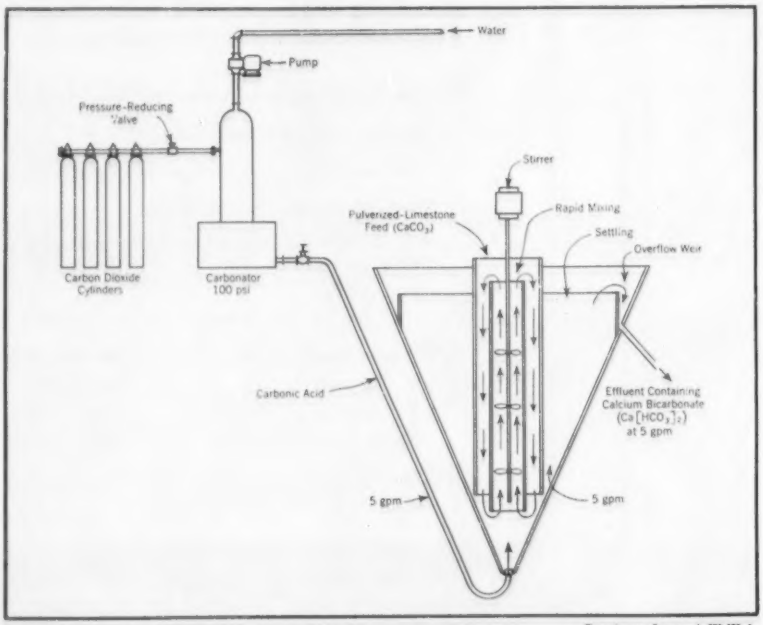
Bicarbonate Alkalinity

Bicarbonate alkalinity is considered an important factor in alum coagulation. In addition the calcium radical has been shown to be an effective corrosion inhibitor. As long as there is sufficient bicarbonate alkalinity to react with the alum there will be satisfactory coagulation but if there is not, then coagulation will proceed in an unsatisfactory manner. Insufficient bicarbonate alkalinity may occur during the spring runoff, when the surface water resulting from the melting snow carries a very low mineral content and high turbidity. This condition is usually alleviated by the addition of hydrated lime, soda ash or caustic soda which are not entirely satisfactory because they do not contribute bicarbonate alkalinity. These chemicals are also expensive. To overcome these problems the author has carried on extensive research in an effort to discover some practical method of utilizing that inexpensive but difficult to dissolve chemical, pulverized limestone. The author hit upon the idea of utilizing carbon dioxide and found that this gas would dissolve the pulverized limestone at a pH of 4.5. A pilot plant was placed in operation as shown in a diagram in the article. The results indicate that the process is workable and that good results can be obtained at a reasonable cost.

"Production of Bicarbonate Alkalinity." By James Girard. *Jour. A.W.W.A.* June, 1959.

More and Better Water

In this article the author reviews the problems of the water industry as a whole and cites several examples of how certain cities have had to cope with increased per capita



Courtesy Jour. A.W.W.A.

● **PILOT plant used to produce bicarbonate alkalinity is shown in this diagram.**

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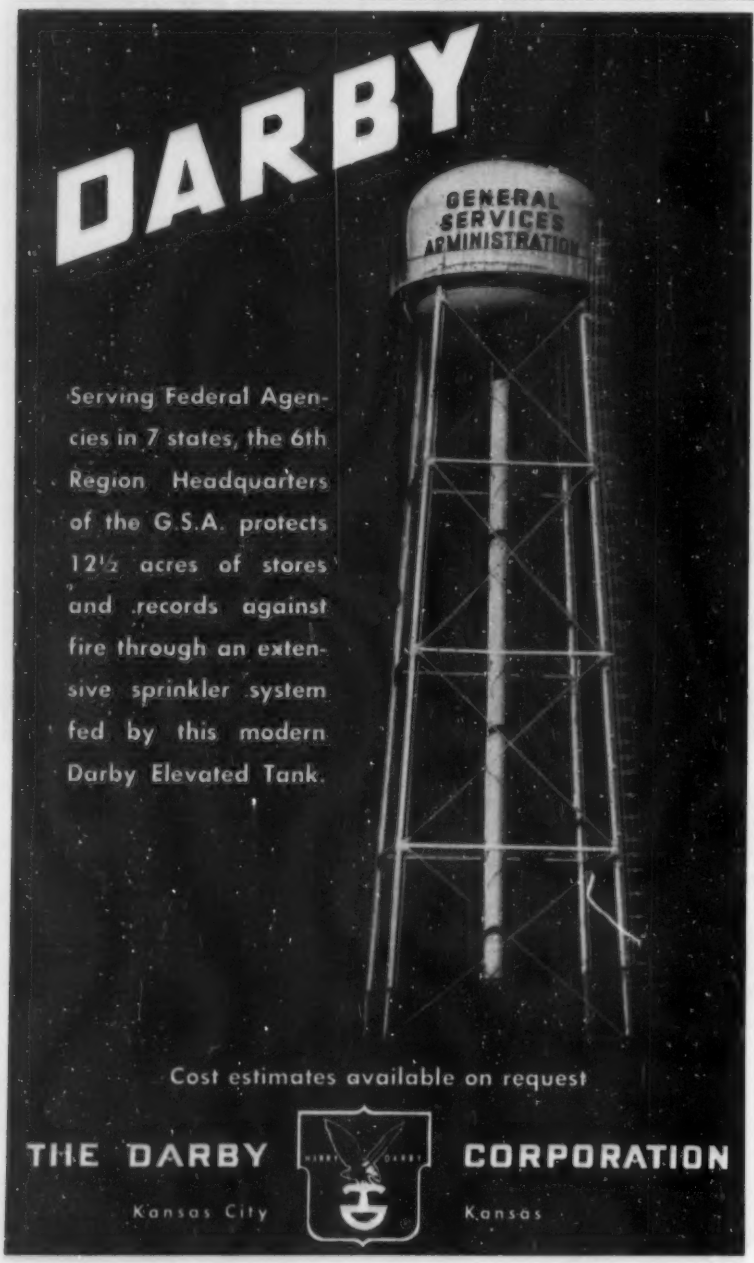
use as well as increased population in their respective jurisdictions. For instance, Wichita, Kansas, Colorado Springs, Colorado, and Greenville, S. C., are planning to construct or have already completed construction of earth dams to form large reservoirs to supply future needs. Springfield, Ohio, has developed an entirely new ground water supply a short distance from that city. These same cities have found it necessary to construct larger and longer transmission lines to carry this raw water to the treatment plant in the city. Vertical turbine pumps have been found to have some important advantages, namely: minimum space requirements; favorable head-discharge characteristics; motors located above flood level; and positive suction under all pumping conditions. The process of coagulation has received more consideration in research programs. Alum, hydro-fluosilicic acid and activated carbon are being stored and fed in liquid or slurry form in an increasing number of plants. Higher rates of filtration are being accomplished by an improved knowledge of prefiltration treatment. Surface-wash equipment is being installed in an increasing number of plants. Improved filter control devices are available and the future will probably see more widespread use of automatic and remote filter control equipment. Greater consideration is being given to planning to meet the water demands for municipal, industrial and agricultural purposes on a state level. Water management laws have been proposed and discussed by public and private officials. The water works industry can and should help shape any future policy.

"More and Better Water." By Paul D. Haney. *Water Works Engineering*, June, 1959.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Improved Water Service

Lancaster, Pa., was faced with the problem of a continual increase in water consumption which threatened to outrun the design capacity of existing facilities. An evaluation of the Conestoga Creek as the present source capable of fulfilling future needs, the present and future municipal and industrial water requirements and the present treatment facilities was made with the following recommendations: 1) The Susquehanna River be used as the source of a new supply. 2) A filter plant be built east of the river with an initial capacity of 8 mgd. 3) A reservoir 4¾ miles east of the filter plant be provided. 4) A transmission line be laid to connect the filter plant with the reservoir and bring water into Lancaster. 5) Additional suburbs on the lines but with small storage facilities be included in the project. 6) The present filter plant and pumping station on Conestoga Creek be given some extensive repairs and improvements. 7) Construction and financing be handled by the formation of an Authority and the sale of revenue bonds. The city approved the recommendations, and while the new facilities were under design, the rehabilitation of the old plant was undertaken. A detailed description, including schematic drawing and pictures, is included in this article. The city of Lancaster now has ample water for some years to come.

"Improved Water Service." By C. C. Wilbur. *Water and Sewage Works*, June, 1959.

Mobridge, S. D., Water Plant

The water treatment facilities being provided to furnish water for the city of Mobridge, S. D., the Milwaukee Railroad and the Montana-Dakota Utilities Company (settled

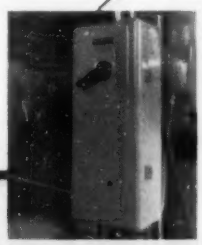
FLUIDICS AT WORK

SIMPLEX know-how automates wash cycle at Mt. Clemens, Mich.

No need to walk back to the panel—table contains Simplex remote control station to set wash cycle into operation, either automatically or manually.

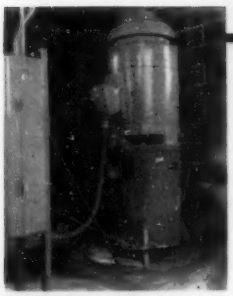
Easy to read from any point in the filter gallery—big 24-inch dial Simplex wash water gauge with automatic indicator light to show status of pump operation.

The heart of this fully interlocked system is the Simplex master control which translates information into an automated operation of the wash cycle at this recently enlarged Mt. Clemens filter plant.



To maintain desired rate—magnetic reversing motor starter automatically positions butterfly valve.

Controls rate automatically—butterfly valve is electrically operated for instantaneous response to panel controls.



Acts on signal from panel—magnetic starter automatically sets wash water pump in operation.

Wash water pump furnishes continuous flow.

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water only) must operate under some conditions which would be considered extreme. Water elevations, temperatures and turbidity make up the extremes under which the plant must operate and for which it was designed. The water levels on the new reservoir will fluctuate between 1,540 and 1,620 after the Oahe Dam on the Missouri River is entirely completed. The plant was built mostly below ground level to operate in the extreme low temperatures. The most difficult factor was to design a treatment plant capable of treating the highly turbid muddy water of the Missouri River and at the same time capable of handling the problems usually associated with possible algae growths at certain times of the year. The plant is composed of two separated elements: the intake is located on the edge of the future lake while the treatment facilities are located on a relatively high level some 1,200 feet distant. The treatment plant is set deep in the ground and is covered with 30 inches of earth to prevent freezing in the winter. The present plant consists of three treatment units set side by side. Each unit consists of a filter, flocculator basin, settling basin and recarbonation basin laid out in a modular plan which will permit orderly expansion without complications in the future. The clear well sets below the filters. The plant is designed for softening. The operators control the filters and wash-water pump from the filter console.

"Good Water Under Trying Conditions." By Mark G. Culbreath. *The American City*, June, 1959.

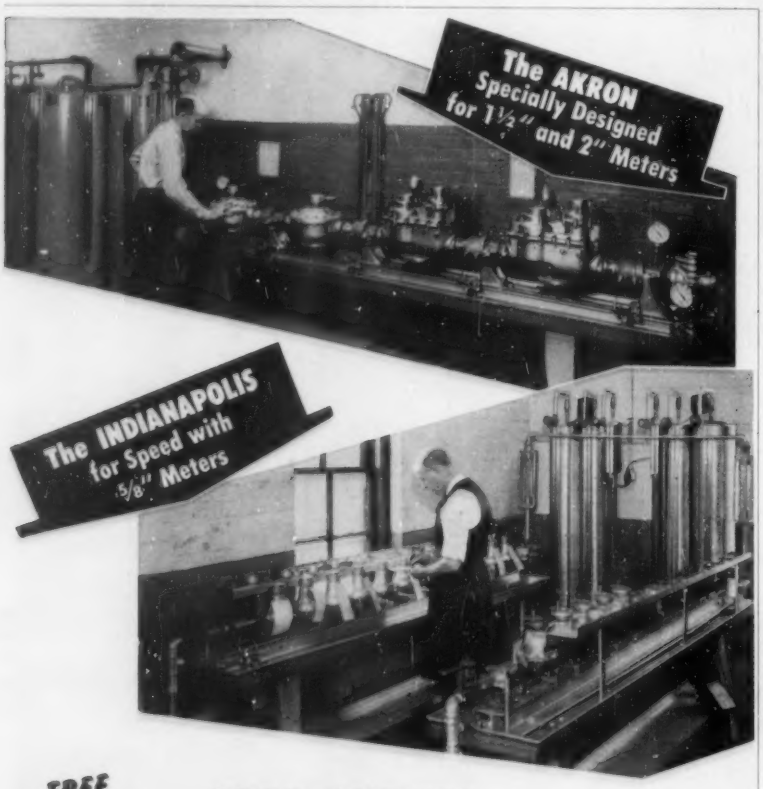
Reservoir Holds 3-Month Storage

In early 1959 Newport Beach, Calif., completed construction of a new reservoir which will provide storage for 600 acre-feet of water. The reservoir was built in a narrow, V-type canyon where the natural terrain makes an efficient site for the 40-ft. deep, 15-acre surface, reservoir. The site was also efficient from the standpoint of gravity flow, being high enough to provide adequate pressure to areas likely of expansion in the future. The author describes the problems of excavation, drainage and underdrainage and the actual construction of the reservoir. The 500,000 sq. ft. of the 3 to 1 sloping walls and the 500,000 sq. ft. of the reservoir's bottom were treated with Borascu, a patented weed killer made of borax powder. A 3-inch asphaltic-concrete surface was laid directly over the earth. This was constructed with ¾-inch to No. 4 gravel, proportioned to produce voids and thus a pervious lining which would permit some upflow with the reservoir empty. The pipes, along with a 12-in. drain line, enter the reservoir through an inlet-outlet tunnel, 16 ft. wide and 8 ft deep, running from the control house on the reservoir bottom through to the outside of the embankment. At the present time the City is seeking other sources, perhaps wells, in case the Los Angeles water demands will not permit Newport Beach to obtain part of its supply from the Metropolitan Water District as it does at the present time.

"New Reservoir Provides 3-Month Storage." By Paul W. Travis. PUBLIC WORKS, July, 1959.

Double-Walled Reservoir

A double-walled clear water basin designed for safe underground storage of 10,000,000 gallons of purified water, as well as for economical construction, now serves the Chain of Rocks Purification Plant of the City of St. Louis. The hollow-wall arrangement, with underdrains, forms a dry well that eliminates the



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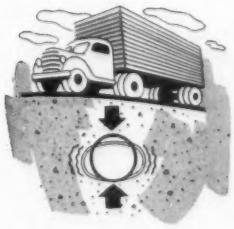

WATER HAMMER

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possibility of contamination from high ground-water outside and overcomes the objection of the Missouri State Department of Health to storing purified water below ground level. Design features of the basin, which expedited construction, include: 1) The floor and roof are level parallel planes; therefore all columns and cells are of equal height. 2) Walls of constant thickness are composed of identical repetitive units except at corners; therefore form costs are reduced to a minimum. 3) Cells or piers can be omitted, without any special preparation, to leave gaps during construction for the passage of materials and equipment. Construction progress and the methods employed by the contractor are illustrated by photographs, taken during construction, which show details of the basin.

"Double-Walled Reservoir." By E. E. Easterday. *Civil Engineering*, June, 1959.

Other Articles

"Water Meters—Selection, Installation, Testing and Maintenance." A manual on water meters has been prepared by AWWA Committee 8610D on Meters. The first three chapters appear in this issue, the remaining chapters will appear in subsequent issues. Jour. A.W.W.A., June, 1959.

"Effectiveness of **Coarse-Grained Media** for Filtration." Report of a 3-year study at the University of Arkansas. By Loren R. Heiple, Jour. A.W.W.A., June, 1959.

"Water Reuse in Texas." A report of an investigation on waste water in Texas and its present and future reuse. By E. F. Gloyna, W. R. Drynan and E. R. Hermann, Jour. A.W.W.A., June, 1959.

"Selset **Reservoir.**" An 8.5 mg. reservoir is under construction in North Yorkshire, to increase water supply to one of England's major centers of heavy industry. By Walter Sekules. Water and Sewage Works, June, 1959.

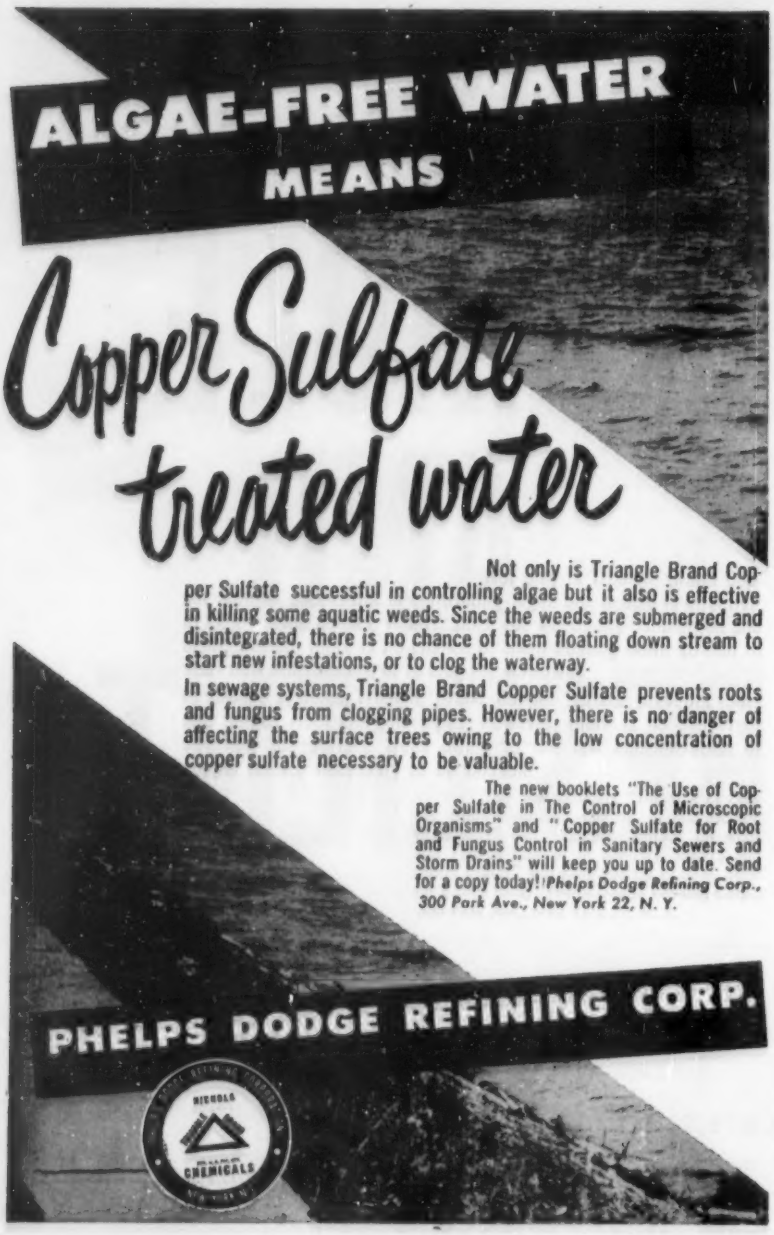
"Instrumentation for **Process Control** in a Modern Water Treatment Plant." The use of instrumentation and centralized control at the Kansas City, Mo., water treatment plant have permitted optimum economy and efficiency for plant operation. By Andrew A. Zahner. Public Works, July, 1959.

• • •

Control of Trickling Filter Flies

Many methods have been used to control *psychoda*, the trickling filter fly, which is often objectionable, particularly with standard rate filter installations. Various chemicals have been used, including DDT and BHC, but in most cases the flies have developed resistance to these rather quickly. Using a rotation system of such chemicals has been helpful, but has not solved the problem. Flooding the filter for 8 to 24 hours kills the larvae but is not feasible at many plants and reduces the efficiency of treatment at others.

The Leeco Chemical Company of Miami Beach, Fla., produces a formulation called RSC in which it is stated, DDT is combined with an additive which blocks psychoda resistance to insecticides. Field tests performed in Illinois, Texas and Florida in 1958 demonstrated successful control where *psychoda* were not amenable to control by other insecticide. RSC was applied to the filter by dosing through the primary tank effluent. After each application, control was achieved for a period of one to two months, depending on the condition of the filter bed and the duration of the life cycle of the fly. BOD determinations were run before and after each application and once weekly during the interval between applications. It was shown the filter efficiency was not impaired in any instance. Amount of RSC applied is not stated but the treatment is said to be "economical."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CHEMICALS

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Nothing matches salt as an effective, inexpensive, remover of snow.

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Banox keeps this from happening. A small amount of Banox added to the salt reduces corrosion due to salt by as much as 95%. Only one pound of Banox need be added to 100 pounds of salt in order to furnish this protection. (Ready-mixed Banox and rock salt is available from many suppliers.)

This means that an entire city can be protected from winter salt corrosion for only a few cents per capita.

Easy to handle and to mix with the salt, the dispersion of Banox on the street does not have to be thorough —moving traffic equalizes the strength to the desired level as ice and snow melt.

In addition, Banox is non-toxic, odorless and completely harmless.

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BANOX KEEPS EVERY SCRATCH FROM LOOKING LIKE A SCAR!

GLOBAL WATER IMPROVEMENT PROGRAM
Planned by World Health Organization

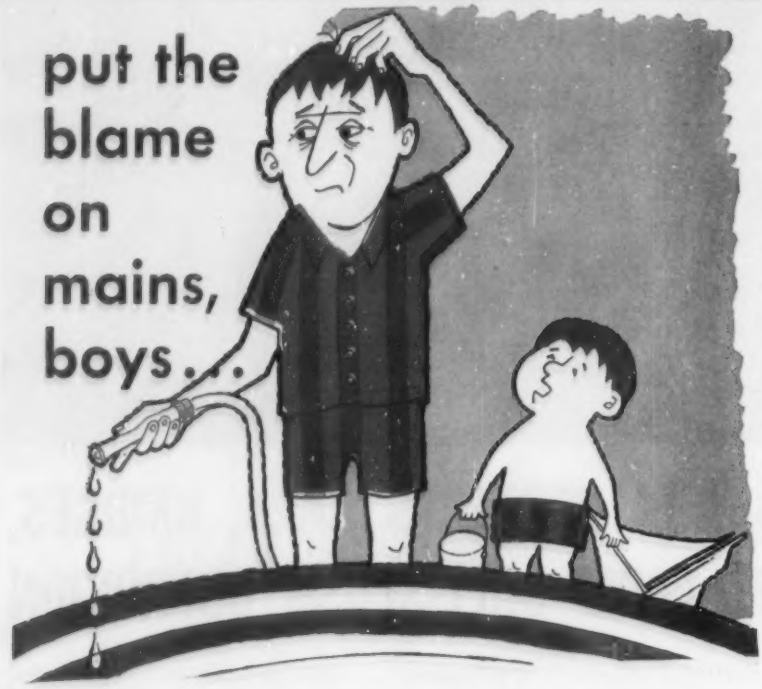
A global community water supply program has been approved by the 12th World Health Assembly held recently in Geneva. Recognizing the tremendous part that adequate water supply has in the health and well-being of people everywhere, the assembly granted a first priority to this activity in the world-wide environmental sanitary program.

Dr. M. G. Candau, Director-General of the WHO stated: "It is disheartening to record that in 1959, in many major cities and their densely urbanized satellites, many millions of people are still dependent upon individual wells, springs or itinerant purveyors for this life-giving commodity. Cities, ranging from two to seven or eight million people, not only fail to furnish water through pipes to households of several hundreds of thousands of their inhabitants, but even to those directly connected to the system they supply an unsafe water, often on a rationed basis of a third of each day or less. This significant fact is often ignored in determining environmental sanitation programs.

"The labor involved in drawing water and transporting it for a long distance, a task which often falls to the lot of the women, results in their virtual enslavement. Frequently as much as one-half of their time, day after day, month after month, is taken up with this essential chore. A very simple calculation will show that there is no more efficient means of transporting water than by a pipe. A small pipe, one inch in diameter, will deliver in a day, without human effort, as much water as can be carried by 150 women working steadily for eight hours. Even in the most advanced countries there are still great deficiencies."

The Assembly requested the Director-General to cooperate with member states in projects to provide adequate and safe supplies of water to inhabitants of their communities; and, furthermore, to continue his study of ways and means of rendering assistance, including an investigation of existing international loan or other funds which might be available for investment in such facilities:

It is also recommended to Member States: (a) that priority be given in national programs for the provision of safe and adequate water supplies for communities; (b) that, wherever necessary, national or provincial water boards be established and given authority to deal with the various legal, administrative and fiscal responsibilities involved in such a program; (c) that all available national and local resources of money, materials and services contributory to such a program be mobilized; (d) that within each country requiring such a facility a revolving fund be established to provide loans for water supply development to local agencies of governments; and (e) that full advantage be taken of existing international loan funds.



Did you hear a lot of customer complaints about low water pressure last summer? After the spring's heavy rains which filled reservoirs to the brim all over the country, *there should be no water shortage.* The problem probably rests underground . . . mains and distribution grids choked by pressure-killing tuberculation and corrosion.

There's one sure cure for your pressure problem . . . the Centriline Process. Centrilining permanently increases carrying capacities in all sizes of pipe by eliminating tuberculation and corrosion forever. After loose scale and tubercules are removed from the pipe, the Centriline machine applies a smooth, uniform coating of cement-mortar to the pipe wall by centrifugal force. Fast and economical, Centrilining is accomplished with a minimum of interruption to surface traffic, since the pipes are lined in place and excavations are not required at laterals and services.

With the introduction this year of the new, small diameter Centriline machine, you can permanently protect all water lines from 4 to 144 inches in diameter. Send today for our new brochure which fully describes the Centriline Process.

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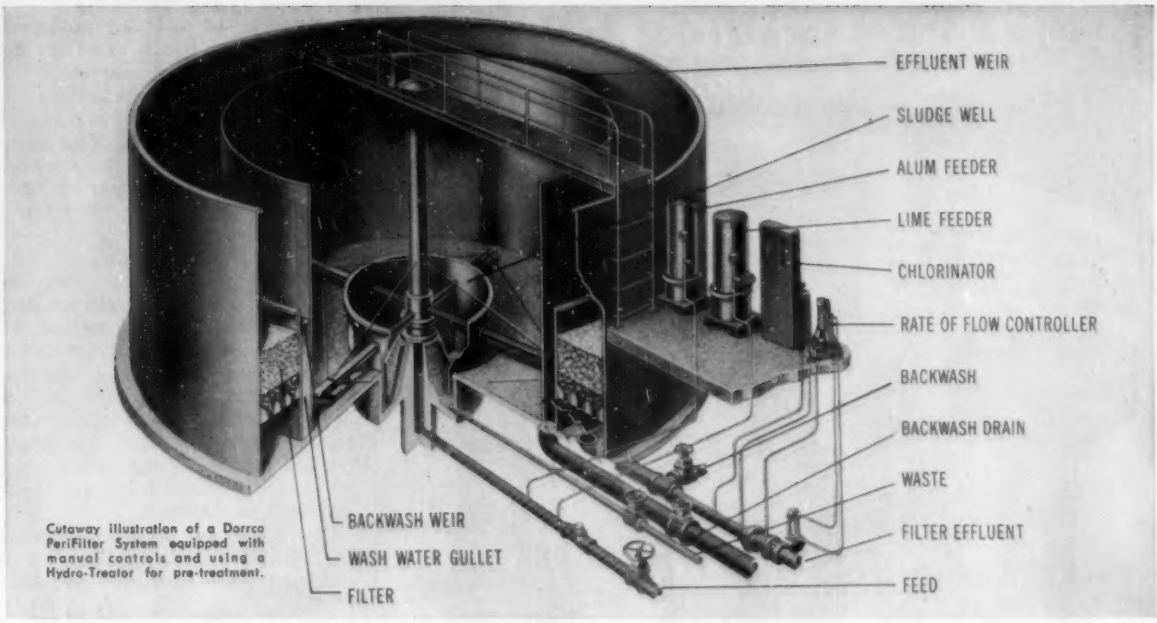

Cutaway illustration of a Dorrco PeriFilter System equipped with manual controls and using a Hydro-Treator for pre-treatment.

NEW DEVELOPMENT IN "UNITIZED" WATER TREATMENT

Dorrco PeriFilter Systems now available with manual, semi-automatic and full-automatic controls . . . costs are cut still further . . . design flexibility greatly increased . . .

Experience gained since 1954 has now been translated into major improvements in the Dorrco PeriFilter System. The basic design, field-proven on a wide range of treatment conditions, permits installation of pre-treatment unit and filter in a single tank. With this "unitized" approach, additional units can be added as demand increases. Construction costs are cut up to 40% compared with conventional pre-treatment and separate filter plants.

Now, with the availability of manual, semi-automatic, or full-automatic controls, a standard PeriFilter System can be selected to provide maximum economy consistent with good engineering practice. On a "unitized" basis, manually operated units are available with capacities up to 2 MGD and semi-automatic units up to 6 MGD.

A Dorrco Hydro-Treator or Dorrco Clariflocculator can be incorporated in the PeriFilter so that either high-rate or conventional pre-treatment can be utilized. Using one or another of these combinations, Dorrco PeriFilters are now in successful operation removing hardness, turbidity, color and/or iron and manganese.

If you'd like more information on the Dorrco PeriFilter System, just drop a line to Dorr-Oliver Incorporated, Stamford, Conn.

Hydro-Treator, PeriFilter, Clariflocculator T.M. Reg. U.S. Pat. Off.

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This cast-iron plug screws into brass insert . . . cannot be twisted or broken off.
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STYLE B—for use with lead (illustrated) or copper pipe.
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Further, the assembly authorized the Executive Board to accept any contributions which may be offered for the purpose of providing assistance to governments in planning, preparing for and providing other technical assistance in the development of community water supplies; and permitted the Executive Board to delegate this authority to the Chairman of the Board.

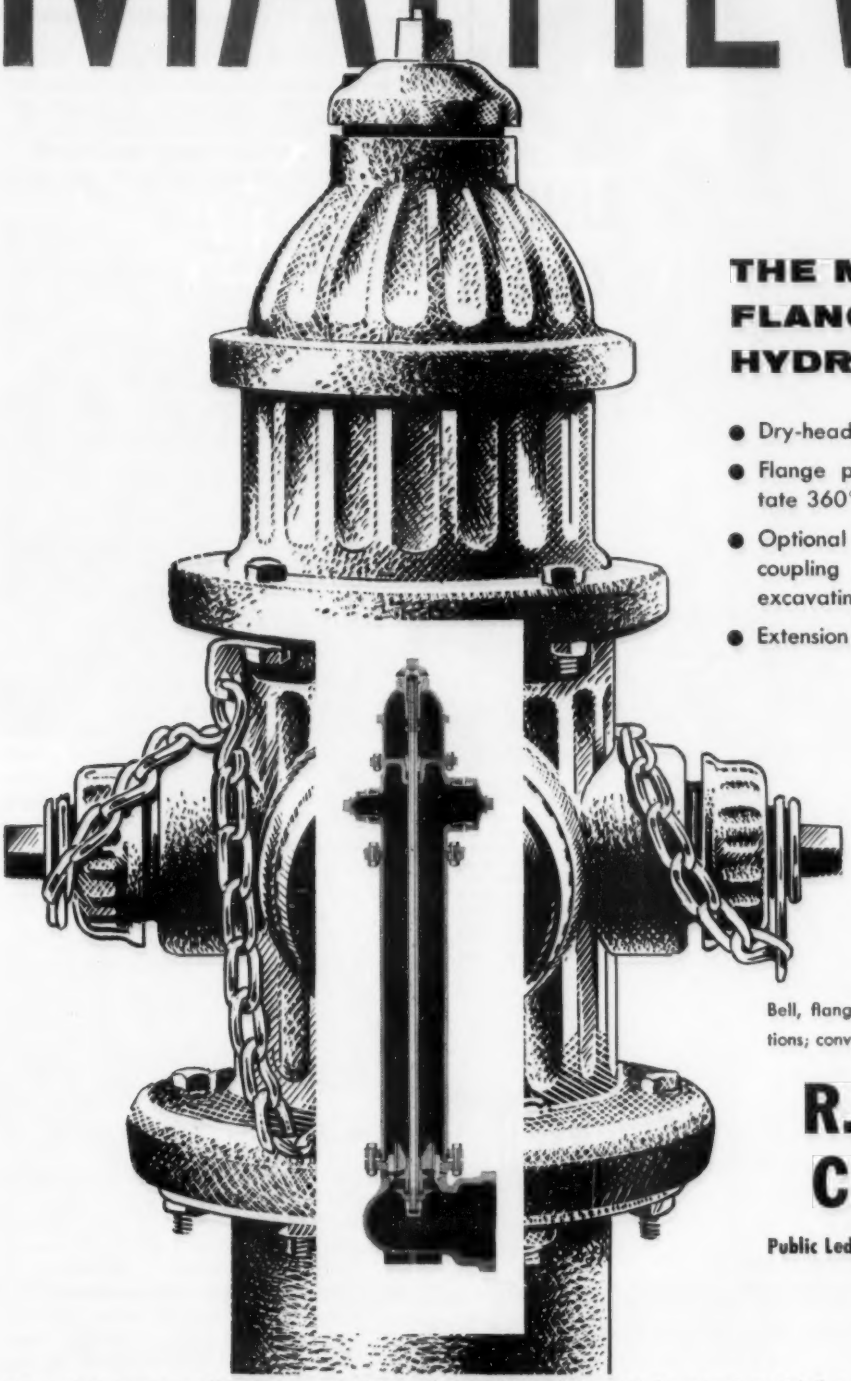
The Director-General was requested to establish, under existing financial regulations, a special account for these purposes; and it was provided that the funds in the special account should be available for incurring obligations for water supply purposes and that the unexpended balance of the account can be carried forward from one financial year to the next.

The spearhead program proposed by WHO, was summarized in a statement as follows: "Member States, with the leadership of WHO, will focus on a program to bring to the houses of the people of the world safe drinking water in ample quantities. A concerted drive on this should bring great results. Such an effort would not exclude all other sanitation activities, but it would place first things first. It would dramatize an overwhelming need and desire of all people. It would not be necessary to waste precious years to educate people toward a desire for better water. Actually, people are ahead of the experts on this point. The practitioners should catch up with the people.

"For such a program to be successful it should move rapidly beyond lip service to real effort, including budgetary allotments, increases in skilled personnel and actual operating programs. Its success would demand of ministries of health a militant and continuing leadership and a far closer cooperation with departments of public works than now generally exists. It is sound to separate the stimulative functions of a health department from the executive functions of a public works department. Such administrative separation, however, does not justify each in going its own way. Their cooperation is essential in carrying forward a water supply program."

The resolution adopted by the Program and Budget Committee asked the Director-General "to continue his study of ways and means of assisting governments to provide safe and adequate supplies of water to inhabitants of their communities, including an investigation of existing international loan or other funds

MATHEWS



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- Dry-head construction
- Flange permits nozzle section to rotate 360°
- Optional breakable flange and stem coupling permits replacement without excavating
- Extension section available

Bell, flange or mechanical-joint pipe connections; conventional or "O" ring packings

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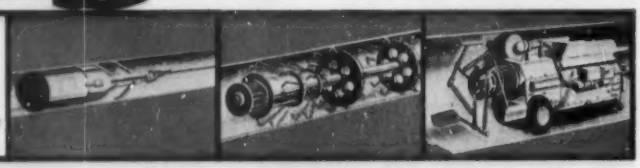
3 *processes*



THE TATE PROCESS is for pipe diameters from 4" to 16" and is done, "in place," after by-pass lines are set up to carry on with water service.

First, the pipe is scraped and cleaned. Then, cement mortar is fed in and applied under pressure to a compact thickness of 3/16" to 1/4" giving the final effect of one continuous, cement mortar lined tube.

THE SPUNLINE PROCESS is partly TATE and partly centrifugal, developed to provide a thin lining for preventing corrosion and to restore hydraulic flow, particularly in cast iron pipe. The cement mortar lining can go past fittings and openings. It can be applied "in place." Uninterrupted continuity is obtained.

CENTRILINE Centrifugal Process. Cement mortar lining ingredients are mixed to rigid requirements and applied under a high velocity spray with uniform speed. Rotating steel trowels spread the mortar to a smooth, hard finish. Pipe sizes vary from 16" on up to 144". Clay, cement, brick, steel, cast iron and wrought iron pipes may be CENTRILINED.

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which might be available for investment in such facilities."

This resolution also asked the Member States of the World Health Organization to give priority, as previously stated, in their national programs to the construction and extension of supplies of safe water to communities, and suggested adequate financial arrangements to provide loans for water supply development to local agencies of governments.

The global water supply project represents a shift of emphasis by the WHO. Previously, the health and sanitation program was all-inclusive and stressed particularly malaria control, home sanitation and food and milk control. It has been decided that greater progress is possible by an effort to supply safe water, since this coincides with the desires of the people more nearly than do the other services.

• • •

New Computer Programs in the Field of Sewer Hydraulics

When the City of Chicago unveiled the computer installation in its Bureau of Engineering, Dick Van Gorp, Chicago's chief engineer revealed that the city has developed three computer programs described as unique in the field of sewer hydraulics.

Two of the Chicago developments are known as "Program for Urban Runoff Computation" and "Program for Structural Analysis and Design of a Reinforced Concrete Arch Sewer." Work is now being completed on a third program which will be used to determine optimum pumping station capacity. This problem has such a myriad of calculations that it would be impractical to attempt to solve manually.

All three programs use the G-15, a low cost, medium size, general purpose electronic digital computer manufactured by the Computer division of Bendix Aviation Corporation and which Chicago has installed on a rental basis.

The "Program for Urban Runoff Computation" was prepared for the "Chicago Hydrograph Method of Sewer Design" developed by A. L. Tholin, now administrative engineer in the Department of Public Works, and Clint J. Keifer, Chicago's sewer hydraulics engineer. Mathematics involved in the comprehensive "Chicago Method" require approximately one month for manual solution. Machine time on the computer is one hour for a 9,000-acre area.

Uniform High Quality Concrete with PLASTIMENT

This 415 foot diameter concrete ring girder will support the retractable, stainless steel dome of Pittsburgh's new Civic Auditorium. Concrete was placed at ambient temperatures varying from 35° F to 95° F. By varying the proportions of PLASTIMENT according to temperature, the water/cement ratio and setting time were kept nearly constant and the quality of concrete, consequently, uniform. PLASTIMENT is specified in over 40,000 cubic yards of concrete for this structure.

To achieve quality and uniformity in concrete with economy, use PLASTIMENT. Call Sika or your nearest distributor for complete technical information.

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Architects: MITCHELL & RITCHEY – Pittsburgh, Pa.
Consulting Engineers (substructure):
R. A. ZERN – Pittsburgh, Pa.
Consulting Engineers (superstructure and retractable dome):
AMMAN & WHITNEY – New York, New York
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DICK CORPORATION – Large, Pa.
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The "Program for Structural Analysis and Design of a Reinforced Concrete Arch Sewer" reduces mathematics of one week to 23 minutes of machine time. No time reduction comparison is available for the pumping station program since there is no known previous attempt by manual analysis to include all the factors involved.

The "Urban Runoff" and "Structural Analysis" programs have been published and made available to other G-15 users through the Bendix Computer Users Exchange Organization. The pumping station program will be published and made available to other users shortly. All three represent the combined efforts of Keifer, sewer hydraulics engineer, and Aizad Kahn, a civil engineer in Chicago's Bureau of Engineering.

George DeMent, Chicago's commissioner of public works, said the city expects savings in both engineering time and money from use of the G-15. In addition to sewer applications, the Bendix computer will be used in connection with the city's superhighway program on bridge design, interchange geometrics and other similar problems.

Chicago has been investigating electronic computers since 1957. Approximately 14 months ago, city engineers began using the Bendix G-15. They developed their sewer hydraulics programs while renting machine time at $30 an hour from a leading Chicago engineering firm. By establishing its own installation, the city can have full-time use of the computer and cut per-hour cost to $10 or less.

Chicago also becomes a member of the Bendix Computer Users Exchange, an organization composed of and directed by more than 200 scientists, research directors, engineers and industrialists who are users of the G-15. The Exchange library includes more than 100 programs developed for the civil engineering field.

Pedestrian Safety Campaign

Installation of 550 new "WALK-DON'T WALK" signals will highlight New York City's 1959 pedestrian safety campaign. The corner of 42nd Street and Broadway, often referred to as the crossroads of the world, will be the first of 100 intersections throughout the five boroughs to receive the new signals. The new "WALK-DON'T WALK" installation program will increase the existing city-wide total by 50 percent bringing the number of pedestrian signals to 1,630.

Special roving squads of patrolmen have been assigned to key intersections handling large numbers of pedestrians as a part of the educational campaign. "Look When You Walk" will be the theme for a month-long campaign. It will be displayed widely along with the now famous "Cross At The Green—Not In Between" slogan.

Over 70,000 Girl Scouts of the Greater New York Council of Girl Scouts have been designated as New York City's "Safety Scouts". They will participate in the drive by distributing safety pamphlets and lapel buttons. There will be city-wide participation by approximately a thousand governmental, civic, business and social groups with a quarter of a million members, many of which were active during the initial 1958 safety drive. Newspapers, radio and television stations will carry public service messages on jaywalking throughout the drive.

Some 100,000 new Traffic Department safety posters will be displayed during the campaign.

Leaching Drain Solves Two Problems

A RECENT rebuilding job on Long Island, New York, involved the construction of a large paved parking area. Beneath this paved surface, a 630-foot long structural plate arch was installed for use as a leaching drain.

This structure solves two problems. It handles storm water from the parking lot without creating an overload on existing municipal storm sewers in the area, and it also returns fresh water to the soil.

Rapid growth of population and industry has caused a great increase in the demand for ground water supplies on Long Island, especially in the Nassau County area. This has been coupled with increased run-off of storm water from pavements and roofs, which reduces natural percolation into the soil. Accordingly, to preserve the pumping level of ground water and to combat the threat of salt water intrusion, an extensive program of ground water recharge has been developed. These efforts include recharge basins, diffusion wells and leaching drains. In all cases, maintenance and ease of cleaning are important considerations.

On the parking lot drainage project, the leaching gallery utilizes Armco Multi-Plate arch bolted to base channels set in concrete abutments 4½ feet high. The span is 10 feet with the center of the arch 5 feet 2 inches above the base channel. A 3-foot bed of porous material was placed between the concrete abutments to facilitate absorption of storm waters into the ground. Inlets are cut into the drain at intervals to permit connection with the parking lot drain system.

The structural plate arch can be completed as fast as the abutments are placed, and ample working space is provided for silt removal and other maintenance.

● USE OF structural plate arch for this leaching drain provided ample working space for maintenance. Arch was put in place as fast as abutments were completed.

County Supervisor, Mr. Kenneth Hahn, Departmental Chairman of Recorder's Dept. and Mr. Ray Lee, Recorder of Los Angeles County, compare Recordak Microfilms in jackets with the volumes they replaced.

Los Angeles County saves $200,000 a year with Recordak Microfilming

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Taking pictures with a Recordak Microfilmer pays rich dividends in the Los Angeles County Recorder's Office. More than 5,000 documents are recorded daily at fraction of former cost. Recordak also does away with costly bookbinding and paper work on job after job. And it assures maximum security in the preservation of records.

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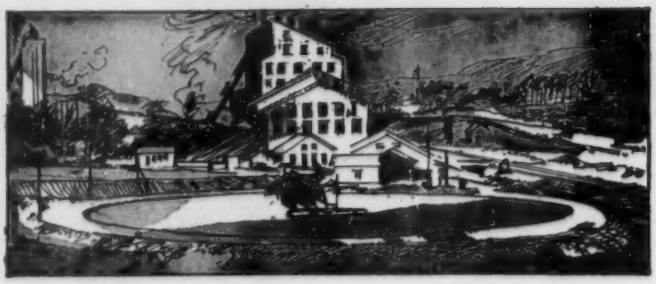
THE
INDUSTRIAL WASTE DIGEST



Prepared by **CLAYTON H. BILLINGS,** ***Associate Editor***

Charges for Treating Wastes

Municipality and industry cooperation is exemplified in paying for waste treatment by the Middlesex County, N. J., Sewerage Authority. Eleven cities and eight industries are charged for the extent to which each uses the treatment facilities. The charges are based on flow, suspended solids, BOD and chlorine demand. The charges are estimated by the Authority for each year in advance, so that the total income is sufficient to pay operating expense and handle debt service. Each contributor is accordingly assessed. Flow meters are established at each participant's point of discharge into the system. Analyses are made of composite samples collected at the various metering chambers. From these the characteristics of the wastes are determined.

"Eight Industries and 11 Cities 'Pay the Freight' for Authority Plant." By M. C. Rand. *Wastes Engineering*, June, 1959.

The Caustic Disposal Problem

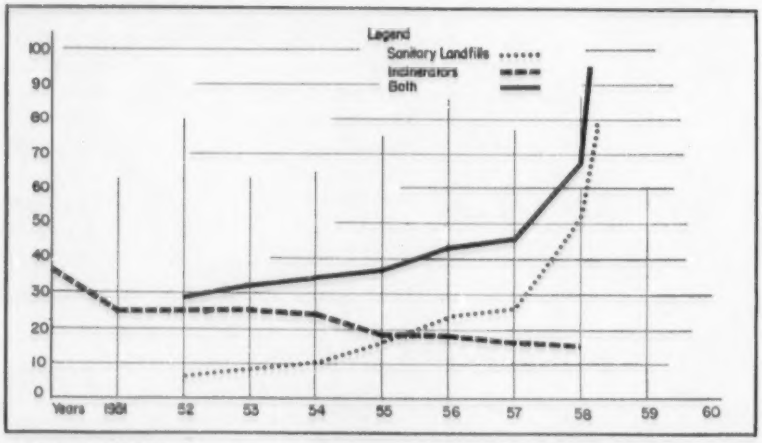
The petrochemical industry makes extensive use of 70 percent sodium hydroxide to purify hydrocarbon streams through conversion of sulfur compounds to disulfides and by extracting phenols and other organic acids. Selection of the method of disposal of spent caustic depends on the degree of stream and air pollution which might result and the need for control. The spent alkali is regenerated whenever possible. One method involves hydrolysis of mercaptans present in the caustic by means of steam and passing them to a stripper where they are volatilized and burned. The separated caustic is suitable for further use until the sulfide buildup makes this impossible. Spent caustic may also be regenerated by oxidation of sulfides by oxygen produced electrolytically from water. About 0.5 to 0.7 lb. of sulfides may be oxidized per kilowatt of direct current power employed. Sulfur and polysulfides formed are separated by gravity. Similar results may be obtained by using air for oxidation. An eductor is used for the injection of oxygen or air. Direct disposal of spent caustic to streams is not recommended except where high dilution is possible with controlled discharge from holding ponds. Occasionally underground disposal by injection wells is possible. Sale of the spent caustic, if the concentration is at least 50 percent, for production of cresols is possible. If neutralization of the caustic by sulfuric acid is attempted as a means of disposal, biological oxidation of the neutralized solution is required. Neutralization by carbon dioxide from flue gas is practicable when the gas can be obtained under pressure sufficient to force it through a column or tank. Hydrogen sulfide phenols and mercaptans are formed from basic salts present and may be recovered or be separately disposed of. Oxidation with air and steam under 50 psi and 250°F is a method employed to convert sulfides to less objectionable thiosulfates.

"Disposal of Alkaline Wastes in the Petrochemical Industry." By Alex D. McRae. *Sewage and Industrial Wastes*, June, 1959.

Step Treatment Controlled by pH

The Lycoming Division of Avco Manufacturing Co. of Stratford, Conn., which makes aircraft engines and parts, produces wastes containing cyanide, chromium, aluminum, copper, iron, lead, nickel and tin. It was desired that the wastes not be separated, but be

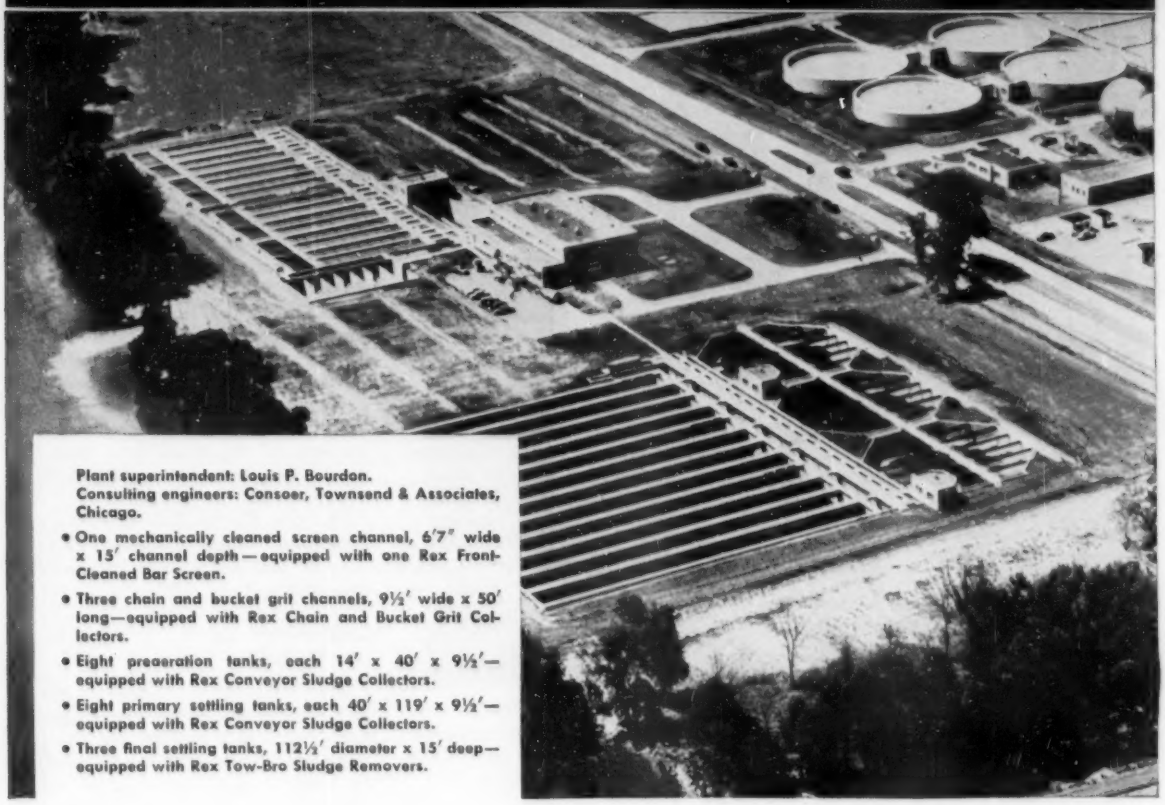
Refuse Disposal Trends in New Jersey



● **THE NUMBER of sanitary landfills and the number of incinerators in use in New Jersey, as reported in a recent issue of the "New Jersey Public Health News".**

SOUTH BEND SEWAGE TREATMENT PLANT...

Model of modern design



Plant superintendent: Louis P. Bourdon.
Consulting engineers: Consoer, Townsend & Associates, Chicago.

- **One mechanically cleaned screen channel, 6'7" wide x 15' channel depth—equipped with one Rex Front-Cleaned Bar Screen.**
- **Three chain and bucket grit channels, 9½' wide x 50' long—equipped with Rex Chain and Bucket Grit Collectors.**
- **Eight preaeration tanks, each 14' x 40' x 9½'—equipped with Rex Conveyor Sludge Collectors.**
- **Eight primary settling tanks, each 40' x 119' x 9½'—equipped with Rex Conveyor Sludge Collectors.**
- **Three final settling tanks, 112½' diameter x 15' deep—equipped with Rex Tow-Bro Sludge Removers.**

The South Bend, Indiana, sewage treatment plant is a model of modern plant design and operation. This plant, which recently went into operation, is designed to function both as a conventional activated sludge and a split activated sludge treatment plant. It processes an average daily flow of 48 m.g.d. Optimum flexibility in treatment and operation was designed into this plant which can partially treat a peak flow to 80 m.g.d. To assure translation of design efficiencies into actual performance...provide maximum operating economy, CHAIN Belt's modern waste treatment equipment was installed in both the primary and secondary treatment stages.

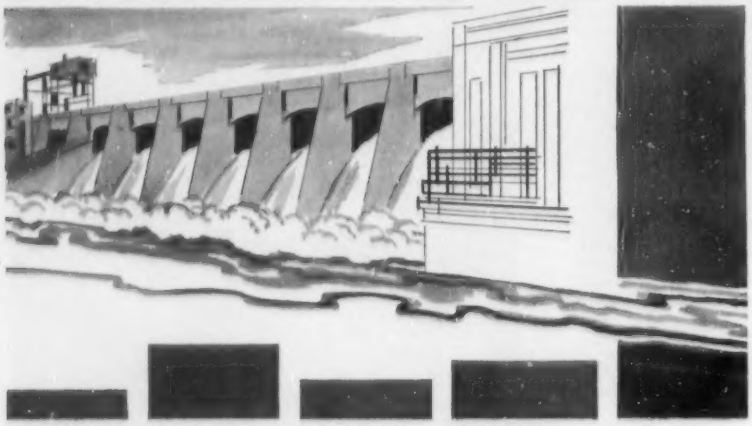
A Rex Front-Cleaned Bar Screen and Rex Grit Collectors provide effective removal of large and inorganic solids. Rex Conveyor Sludge Collectors in the preaeration and primary settling tanks assure efficient preliminary treatment, and positive sludge and scum removal. Rex Tow-Bro Sludge Removers in the final sedimentation tanks provide the positive, gentle sludge removal so important in handling the light, "tricky" sludges encountered in the conventional and split activated sludge treatment processes.

Modern, performance-proved CHAIN Belt equipment and the broad experience of CHAIN Belt engineers provide the right combination for most effective results and maximum operating economies. For information on the complete line of Rex Sanitation Equipment, write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT

treated in steps, in a compact plant arrangement and easily controlled. In the resulting design, conventional processes are employed: oxidation of cyanide by the alkaline chorination method, chemical reduction of chromium, precipitation of metals by pH control and addition of coagulants and clarification. The wastes are mixed after gravity flow to a sump and pumped to an equalizing lagoon. From this point the treatment is in the sequence mentioned, primarily because of the presence of copper. With cyanide oxidation occurring first, copper can be removed by precipitation with other metals. The optimum pH for each successive reaction is automatically controlled. Instruments, chemical feed equipment and the entire system are interlocked with the raw waste pumps. Sampling pumps are located ahead of each treatment step to convey samples to flow-through pH monitors. Pneumatic instrumentation controls the starting and stopping of chemical feed pumps depending on pH measurement.

"Aircraft Engine Wastes Treated in Continuous 'Flow - Through' Plant." By J. J. Salvatorelli. *Wastes Engineering*, June, 1959.



WATER—
World's Largest Industry

Annual U. S. production of steel averages about 120 million tons; coal, 600 million tons; agriculture, 400 million tons; petroleum, 340 million tons. But, based on weight, water supply is the largest industry.

In the United States alone public water supply averages about 70 million tons per day or 25 billion tons per year. Over 17,000 public water systems in the U. S. supply about 17 billion gallons daily to 111 million people. The average costs is about 10 cents per ton delivered in the home—a little over 2 cents per person per day. To do this requires an investment in plant and equipment of some 7 billion dollars.

The people of the United States now are the largest per capita consumers of public water supplies in all history.

The men who design, build, maintain and operate America's public water works deserve more credit than they receive for doing well a job which is vital to the public welfare and the national economy.

This Series is an attempt to put into words some appreciation of the water works men of the United States.

M&H VALVE
AND FITTINGS COMPANY
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Continuous Monitoring For Chlorides

A continuous analyzer for chlorides, similar to that for pH measurement, has been developed. Basically the method relies on a new silver—silver chloride sensing electrode plus a reference electrode and thermo-compensator. The potential developed at the sensing electrode varies with concentration of chloride ions in the solution in which the electrodes are immersed. The potential is amplified for indicating and recording. The sensing electrode is a conventional electrode body containing a hard solid pellet formed from a mixture of silver and silver chloride. Because the potential generated is related to temperature, a compensator for this factor is included in the circuit. Interferences result from the presence of oxidants or reductants, but these deserve attention only in measuring concentrations of chlorides less than 10 mg/L. In general, accuracy within 5 percent can be obtained.

"A New Continuous Chloride Ion Analyzer." By R. H. Jones and T. J. Kehoe. *Industrial and Engineering Chemistry*, June, 1959.

Symposium on Air Pollution

The emission of oxides of nitrogen is a factor in the Los Angeles-type smog and in studying the reduction of these emissions, a method of continuous monitoring for nitric oxide is necessary. A. J. Haagen-Smith, *et al*, describe successful results using the infrared spectrometer. The use of bacterial cells for measuring physiological irritation caused by air pollutants is discussed by A. Goetz and N. Tsuneishi. A membrane culture technique allows exposure of a single cell layer without the chemical protection by its nutrient environment. An impactor was developed to expose a membrane filter strip containing *E. coli* to various air streams. After exposure, the strip is treated with a nutrient and is incubated. The degree of inhibition of growth of the cells is indicated by the length of the track where colonies are absent. The development of a technique for analysis of mixtures of aldehydes in polluted air is described by J. F. Thomas, *et al*. The method may be applied to determine the conditions, with respect to combustion, under which aldehydes are produced. Studies performed by M. O. Amdur on the physiological response of guinea pigs to air pollution support the belief that the inert

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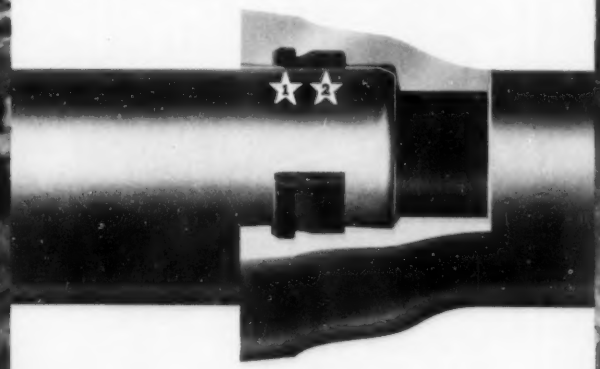

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aerosols carrying a gaseous irritant produce a response on lung tissue proportionately far greater than that by the free gas alone. An investigation of the gas phase reactions of nitrogen oxides with olefins was made by A. P. Altshuller and I. Cohen. It was found that combustion effluent stream products, such as in automobile exhausts, cannot be kept at room temperature more than a few minutes before reaction products are formed. The importance of internally bonded olefins and diolefins in the over-all automobile exhaust problem is emphasized.

Industrial and Engineering Chemistry, June, 1959.

Other Articles

"Parts per Billion Analyses by **Ionization Detector.**" By R. F. Wall. The development of a chamber for ionizing a gas by a radioactive source permits extreme sensitivity in the detection of minute concentrations of air pollutants. Industrial and Engineering Chemistry, June, 1959.

"**Ozone** in Air Pollution Abatement." By W. E. Cromwell. The reaction between ozone and air pollutants appears to be a neutralization of odor formers. Industrial and Engineering Chemistry, June, 1959.

"Development of the **Anaerobic Contact Process.** II. Ancillary Investigations and Special Experiments." By G. J. Schroepfer and N. R. Ziemke. These studies were undertaken to determine the basic actions involved in the contact and separation portions of the anaerobic contact process for treating industrial wastes and sewage. Sewage and Industrial Wastes, June, 1959.

• • •

Sludge Utilization

(*Continued from page* 122)

drawn to an 8-inch depth on the beds. During each of two of the last three years, 17 beds have been drawn, or almost 6 cycles per year for each bed. Minimum bed drying time is from 7 to 12 days, maximum from 6 weeks to 2 months. The record for these beds has been 11 beds in 2 months, which means that each bed was used almost four times in two months.

There are no runways for truck removal of the dried sludge. Forks and a wheelbarrow are used. This is a one-man plant. The single operator does all of the plant work, and is responsible for the plant 24 hours per day and 7 days per week. The dried sludge is stockpiled and given without charge to anyone who wants it. Some is used for farm and garden use. Occasionally too much accumulates at the plant. The plant operator resands the beds about once each 3 years with 2 inches of very coarse sand or very fine gravel. The author found from a recent sieve analysis that the effective size of the sand of the drying beds was 2.0 mm.

Maryville—Initial operation of the Maryville plant was in January, 1957. It is a secondary type plant, with two stages of sedimentation and trickling filters with recirculation. It was designed for a 1973 dry weather flow of 0.93 mgd and wet weather flow of 2.0 mgd. Population of the city was 8500 when the plant was built; design population is 13,000, with very little industrial waste. It has one heated digester with floating cover and gas recirculation equipment, and open drying beds for the digested sludge. The Maryville plant is unique as the first one in the state to contain a raw sludge concentration chamber prior to digestion.

Total volume of the digester is 39,400 cubic feet, 3.06 cubic feet per capita for the design population. The total sludge drying bed area is 20,000 sq. ft., or 1.5 square feet per capita. Solids content of the sludge as it enters the digester is 5 percent; solids content as it goes

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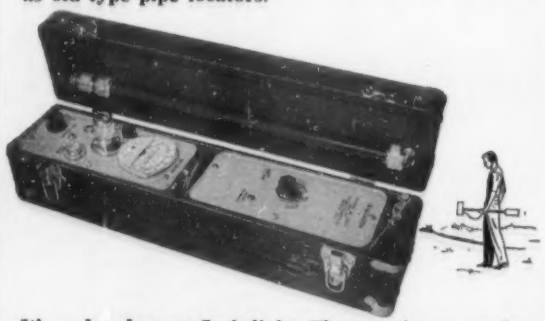

It's as handy as a flash light. The transistors rarely, if ever, require replacement; non-leak mercury cells outlast old type batteries at least ten times. The instrument cases are molded glass fibre. The aluminum connecting handle telescopes to 17 inches, and the entire instrument comes in a substantial carrying case.

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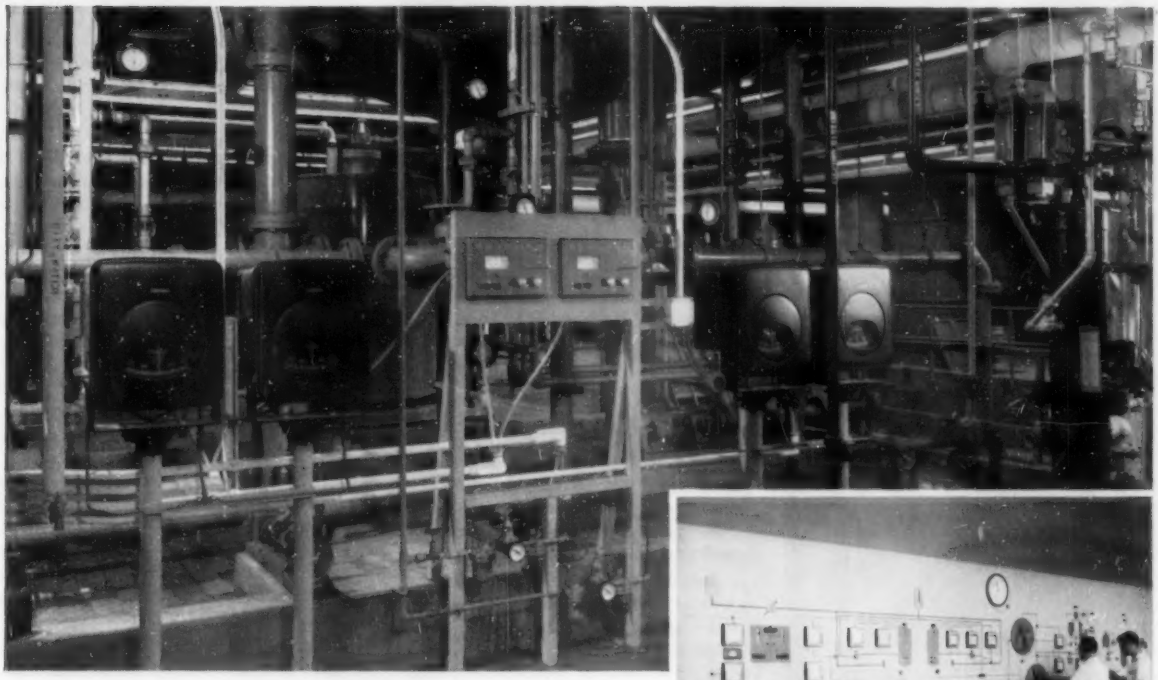
• Four Foxboro Dynalog oxidation-reduction potential transmitters form the heart of this Chromate Waste Reduction System at Boeing Airplane Company. Dynalog instruments transmit pneumatic signal to remote control panel (below). Two Beckman pH Amplifiers can be seen in the center. Consulting engineers: Wilson & Company, Salina, Kansas.



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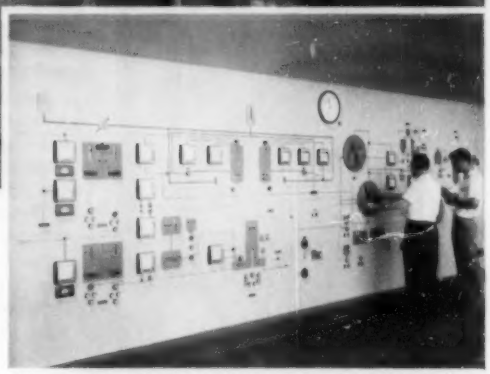

Central Graphic Control Panel for Boeing's Industrial Waste Treatment Plant. Panel includes controllers for flow and liquid level of various tanks, as well as recorder-controllers for the Foxboro ORP meters.

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to the drying beds is 8 percent. Solids content as removed from the drying beds is from 25 to 35 percent. During one year the total volume of sludge drawn to the beds was 80,000 gallons, which covered 8 beds to an average depth of 11 inches. The digester temperature is controlled at 93 to 95° F. The drying period on the beds averages 100 days, although it is probable that the sludge could be removed much sooner than this most of the time if desired.

Murfreesboro—Initial operation of the Murfreesboro plant was in December, 1936. It is a secondary type plant, using two stages of sedimentation and a standard rate trickling filter, with separate sludge digestion in a heated tank. The plant was designed to handle a population equivalent of about 12,000 and maximum flow of approximately 1,200,000 gpd. The present population of the city is above 15,000, and the industrial load from condenseries, cheese plants, milk plant, etc., averages a BOD population equivalent of between 10,000 and 15,000. A survey of the milk industry load in 1946 showed a flow of 820,000 gpd., and a PE of 30,000, but this load has been reduced considerably since that time.

The single digester uses the old style inside heating coils with externally heated water circulated through them. With these it was possible to hold the digester temperature between 90 and 95° until 1953. Since that year the digester temperature has gradually fallen. During 1958, the digester temperature varied between 72 and 82°. During 1958, with a PE load on the plant of 30,000 based on BOD, the digester capacity was down to 0.81 cu. ft. per unit PE. Present dry weather flow through the plant ranges between 1.0 and 1.5 mgd, with wet weather peaks up to 2.5 mgd.

The extreme scum layer depth in the digester has been as much as 16 feet. Digested sludge is taken to four open drying beds, each 25 by 75 feet, total bed area 7500 sq. ft., or about 0.25 sq. ft. per capita based on the present plant loading. By 1947 the plant had become loaded to the point that 24 beds of sludge were drawn that year, totaling almost 30,000 cubic feet. From that year on the combination of overloaded digester and inadequate sludge drying bed area has made it impossible to dewater all of the sludge on the drying beds. Starting with 1949 the first liquid digested sludge was hauled from the plant

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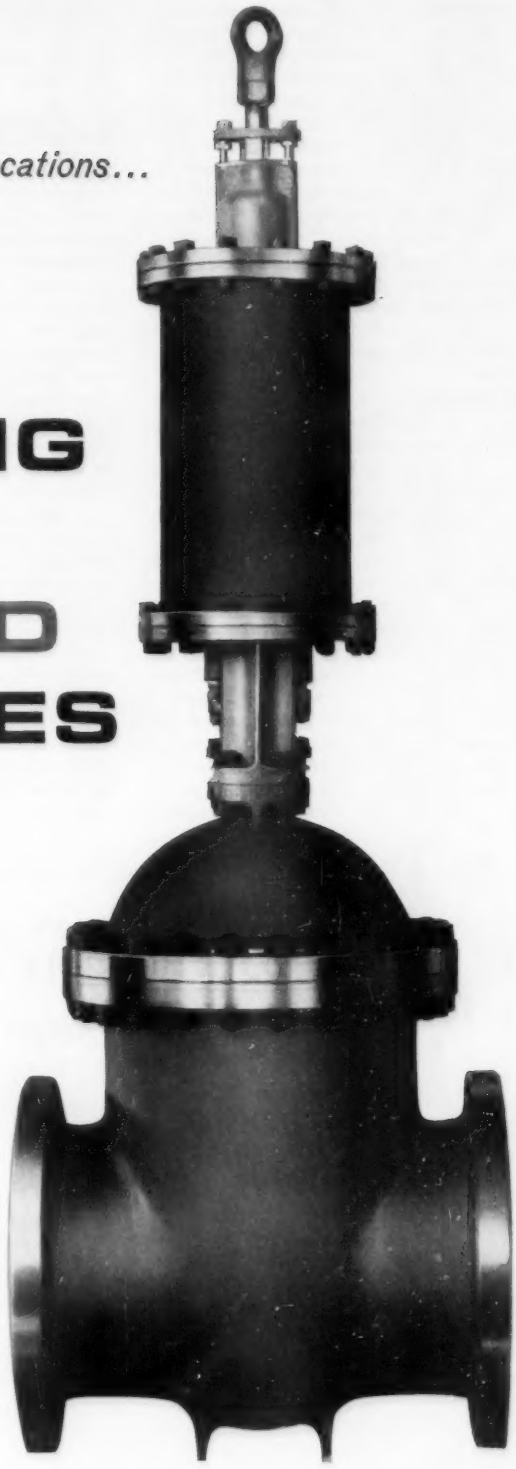

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site in a tank truck for agricultural use, and a smaller part of the sludge each year has been dried on the beds, so that gradually the hauling of digested sludge has virtually replaced the use of the drying beds. The first hauling was done in a 500-gallon truck; this was later replaced with a 1000-gallon truck unit. During 1958, 140 truck loads of sludge were hauled about 7 miles to a livestock farm. The total amount involved was 140,000 gallons, or 18,700 cubic feet. Solids content of the sludge varied from 5.5 percent to 8.8 percent, averaging about 7 percent.

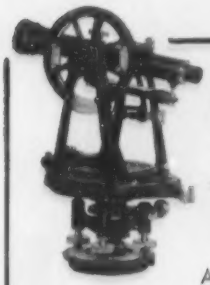
Because of the ease of handling, the Murfreesboro plant has found a steady demand for the liquid digested sludge. Hand labor involved and the odor problems that sometimes result in wet weather, have caused the demand for the air dried sludge to decrease almost to zero at this plant.

The description of the sludge handling facilities at Murfreesboro would be incomplete without a few words about the operator, who has been practically a one-man managing and operating crew since the plant was first placed in operation 22 years ago. Walter Blackman, Sr., has lived with the plant 7 days per week, and often much of 24 hours per day. He is dedicated to his work as few people are, and the remarkably good record the plant has built up under extreme overloading is due in a large measure to the quality of his work in its operation. The plant is located adjacent to a very busy highway, but complaints from odor problems have been few, and although the trickling filter cannot be flooded, and cannot be operated as a high-rate filter for the control of *Psychoda* flies, Mr. Blackman has kept the problem under control. He has kept the most complete and the best records of any operator in Tennessee.

Union City—Initial operation of the Union City plant was July, 1955. It was designed to serve a domestic population of 11,000 contributing 1.1 mgd, plus 0.23 mgd of stronger waste from a meat packing plant; the total BOD PE for design was 16,000. It is a secondary type plant, using activated sludge with two stages of sedimentation, and in addition, it has a roughing filter because of the packing house load. There are no digesters and no drying beds; this was the first plant in Tennessee to use the Komline-Sanderson coil-filter vacuum unit. Raw sludge goes to a holding tank, and from there it is pumped to the filtering room, first being chemically conditioned with lime and ferric chloride, then filtered. The sludge cake from the filter by means of a conveyor belt is dumped into the top of the sludge cake storage hopper, and from there it is loaded into trucks for final disposal on agricultural land.

Trouble developed at the Union City plant when the packing house waste was accepted into it after about one year of successful operation. From the beginning, the load imposed by the packing waste was much greater than that for which the treatment plant had been designed, and with expansion of the packing plant, operating problems have become more serious with time. Exclusion of the packing waste, or enlargement of the treatment plant will be necessary to resolve the problem. This is another situation in Tennessee where efforts on the part of the plant operator have been made to secure a good effluent and an odor-free plant, but in spite of his hard work, the plant has been unable to cope with the packing house load.

This article is based on a paper presented at the Southern Municipal and Industrial Waste Conference at the University of North Carolina in April, 1959.



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The Equipment Distributors' Contribution to HIGHWAY CONSTRUCTION

FRANK SKIDMORE,
Director, Industry Relations,
Associated Equipment Distributors

PRIOR TO World War I, what little equipment was available to the construction industry was generally sold direct to the user by the manufacturer. Today, such a method of operation would be almost impossible. The manufacturer could not economically provide sufficient trained personnel to sell and service his products on a nationwide basis. Through the medium of the distributor, sales and service are handled on a local basis, allowing the manufacturer to devote his efforts to research, engineering and producing his product.

The construction equipment distributor, to be successful, must carefully select the accounts he represents in his territory. By doing so, he eliminates certain equipment that might be considered less attractive to users or unsuitable for the requirements within his area of operation. Following this preliminary screening effort he evaluates each product he selects to determine its application to current or proposed demands. He must have a complete knowledge of his customers' requirements, as well as a knowledge of conditions under which his customer must operate. The user, either the public body or the contractor, or the engineer who designs the project on which construction equipment will be used, desires complete information on the most modern, cost-saving methods of utilizing machines for construction and maintenance. Such information is available through the distributor, who offers it as a part of his services—a consulting service available at the local level on a 24-hour-a-day, every-day-of-the-year basis.

The distributors' sales representatives are in reality specialists, often engineering graduates with much practical experience, trained in construction "know how." They are well informed on new methods and new machines developed by the manufacturer. They are prepared to offer current information on product application in an effort to reduce the user's costs and shorten job time. Frequently they are called upon to assist in analyzing work, to "walk over the job" and make recommendations. Naturally these men are sales minded, but their efforts in fulfilling their responsibility to the customer go far beyond that of the ordinary "salesman" whose primary responsibility and loyalty are to his manufacturers' products.

The distributor demonstrates the equipment he handles in order to point out the efficiency of the unit; to bring the prospect's attention to what he, the distributor, believes to be the outstanding features; and so that the potential user may compare performance either with machines he already owns or with competitive units being considered. Such demonstrations may be to an individual contractor or to a group of public officials or engineers.

They do not always result in sales, but do serve a very worthwhile purpose in bringing to the attention of officials and users the qualifications of modern construction equipment.

The distributor provides an outlet for used machinery which has become obsolete in the hands of the user. Such units are traded in and rebuilt. Then, because the distributor knows his and neighboring markets, he is able to channel such units to small contractors to do subcontracting work at reasonable costs. Many used units are sold outside of the heavy construction field, to users in agriculture, mines, petroleum and other industries. Sometimes, when the useful life of the equipment is all but ended, it is scrapped by the distributor, often at a considerable loss to him, but in the long run, a very real service to both the user and the manufacturer is provided.

The distributor also provides both standard and specialized construction machinery on a rental basis. A user needing an additional unit for a rush job, or special equipment not normally required in his operation, may find the answer to his requirement in a distributor's rental fleet.

One of the most important contributions to construction made by the distributor lies in the area of financing. Through his own organization, or through financial connections, he handles transactions designed to suit the particular requirements of the equipment user. He makes possible special deals, such as rental-purchase transactions, and extends terms or refinances in cases where weather conditions or other hardships interfere with job progress.

Associated Equipment Distributors, the national association of the industry, has for the past several years conducted an aggressive cam-

Snow Fighting With A Tractor Shovel

● **FOUR-WHEEL drive Trojan tractor shovel equipped with a V-type plow cuts through drifts in upstate New York during the severe storms of the 1958-59 season. In addition to the plows, a special snow bucket that spans the wheels is offered for each Trojan model. Mobility of unit assists loading work in congested areas.**

paign at the local and national levels, attempting to educate bankers to the opportunities in financing construction equipment. Bankers, accustomed to financing crops, cattle, real estate, automobiles, etc., long looked with suspicion at the average user of construction equipment and at heavy machinery as a risk. But this picture appears to be changing for the better, partly due, it is hoped, to the efforts of the Association and its members.

The distributors are often called upon as tax consultants where construction machinery is involved. Others have acted as equipment appraisers, either individually or in groups, for contractors, government agencies or financial institutions.

The distributor plays a most important role in the highway construction picture by helping train operators in the proper use and treatment of the equipment sold today. Today's machinery operator must be better informed, more skilled, and quicker-thinking than the operator of a few years ago.

The distributor's service department is staffed with skilled factory trained personnel who are qualified to make either shop or field repairs with maximum efficiency in a minimum length of time. These service men, in addition to making machine deliveries and training operators, train the owners' mechanics, conduct preventive maintenance programs, make periodic inspections of units on the job and promptly handle warranty claims. A considerable portion of the distributor's investment is in his repair parts stock, and he continually strives to better control and balance this inventory so that the right parts are available at the right time. Service facilities and repair parts, available locally and on a 24-hour basis, do much to reduce the equipment owner's down-time.

Many distributors conduct one or more "open houses" each year, to which municipal, county and state highway officials, as well as contractors are invited.

In addition, but sometimes on separate occasions, superintendents, maintenance supervisors, and master mechanics are asked to attend. At such sessions, an hour or so is spent in reviewing each of the several major lines of equipment handled by the distributor. Demonstrations of several units, particularly those with new features, are a popular part of these sessions.

Speaking of educational endeavors, many local associations of distributors—and we have about 50 such organizations throughout the country — sponsor engineering scholarships for deserving young men interested in construction. Many of these groups have local Joint Cooperative Committees with contractors' organizations, such as AGC or ARBA. Discussions are conducted on such subjects as equipment maintenance, operator and mechanic training, disaster relief, depreciation and salvage values, education, end result specifications, mutual promotion of legislative matters, etc. It is entirely possible that mutual benefit might result were these local groups encouraged to work more closely with such organizations as APWA, ASCE, or AASHO, for our meetings with contractor groups have led to some outstanding accomplishments.

Those who are not directly concerned with the actual operation of construction machinery might wonder how the equipment distributor's activities could affect highway engineering. There is a possibility that problems faced by the user in the field of construction are much different than those confronting the engineer. In turn city, county and state engineers may very well have different situations confronting them in construction and maintenance.

Nevertheless, the equipment distributor stands ready and willing to serve in all areas. Owners, operators, engineers, students — anyone interested in construction, or the tools and machinery used in construction, has an ally in the construction equipment distributor.

I do not know of anyone better qualified to suggest modifications, improvements, or new methods than the men who design construction projects, or the men who do the work on these projects.

Manufacturers are constantly on the alert for suggestions from the field. Millions of dollars are spent by manufacturers in research, engineering field testing and developing new and better units, and improving those now existing. It is doubtful if the manufacturer could do this job without ideas and recommendations submitted by the users. The great majority of these suggestions come first to the distributor who receives them on the job, screens them, adds his thoughts, then sends them on to his supplier.

This paper was presented at the 20th Annual Highway Conference, Salt Lake City, Utah, and has been slightly condensed here.

PAINTING PULASKI SKYWAY BRIDGES

FOR THE first time since 1946, and for the second time since the three-and-one half mile span was completed in 1932, the Pulaski Skyway bridges that cross the marshlands between Newark and Jersey City, N. J., are getting a coat of paint.

The contract to paint the Skyway has been awarded to J. I. Hass, Inc., Jersey City, by the New Jersey State Highway Commission. The cost of the project is approximately $500,000.

Allied with Hass as a major supplier is the Joseph Dixon Crucible Company, of Jersey City, manufacturers of the specially-developed graphite paints that are being used. Graphite paint is preferred because of its resistance to thermal influences, to smoke, chemicals, and abrasive salt and sand that soar upward from the dunes and factories of industrialized New Jersey.

The 60 painters will wear out $10,000 worth of brushes (about 600 of them) and stretch eight miles of half-inch rigging cable through the girders during the 155 days the work will be in progress. Approximately 30,000 gallons of paint will be needed to cover the 97,500 tons of steel in the structure.

Weather is a constant problem in bridge painting and the weather bureau is checked often. Rain is no problem—the men simply knock off. Wind is the big bugaboo for high gusts endanger the men and carry away large globules of paint which splatter nearby locations.

● **ABOUT 30,000 gallons of paint will be required to cover the Skyway.**

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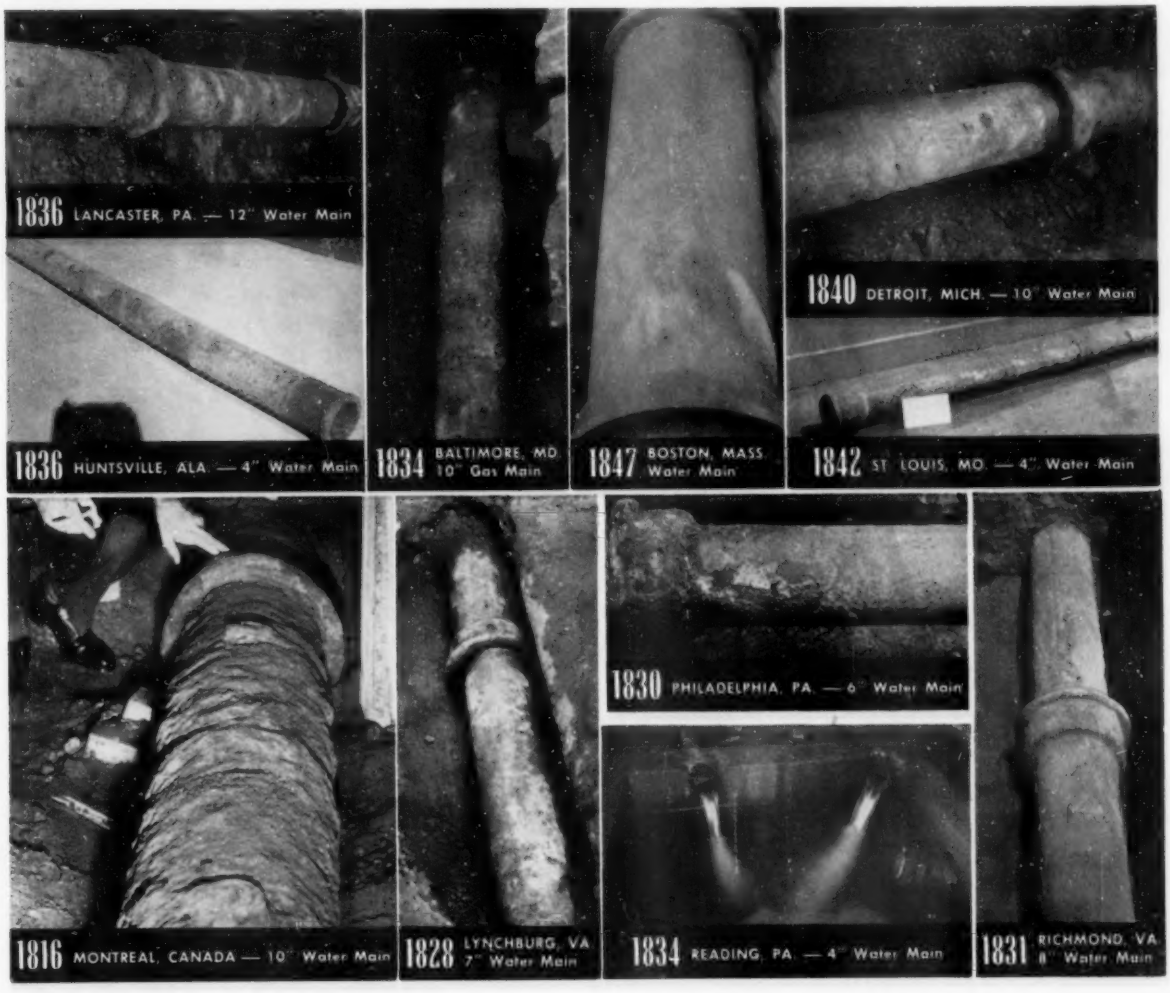
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1834 BALTIMORE, MD. 10" Gas Main
1847 BOSTON, MASS. Water Main
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1828 LYNCHBURG, VA. 7" Water Main
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FROM THE MOMENT a new diesel engine is placed in commerical service, or a new transmission line is energized, or a distribution transformer is hung on a pole, ready to serve an electric utility's consumers, the value of these, and other components of the electric system, begin to depreciate.

In a well-managed utility, the operating revenues must be large enough to defray all operating and maintenance expenditures, such as fuel, salaries, etc. In addition they must be sufficient to compensate for the cost of utility plant depreciation. Since depreciation costs represent the consumption of physical plant properties, they are as vital in proper accounting of the cost of doing business as the consumption of coal or fuel oil for the generation of electric energy.

Depreciation, or loss in service value not restored by current maintenance, is caused by many factors including wear and tear, obsolescence, weathering and the action of the elements, technical changes in the art of design, inadequacy, and similar causes. Not all items of property depreciate at the same rate, nor from the same causes.

For example, the dam of an hydro-electric plant, with an estimated service life of sixty years, would have a uniform annual rate of depreciation of 1.66 percent of the cost of the original investment, beginning in the year in which it was constructed, whereas an internal combustion engine, subjected to a higher degree of wear and tear, might be expected to render useful service for only thirty years, corresponding to a depreciation rate of 3.33 percent.

In this example, the cylinder walls, pistons, and bearings of the engine physically deteriorate during every hour that the unit is in service. This is depreciation caused by wear and tear. Conversely, a No. 6 copper conductor suspended from the cross-arms of a distribution feeder pole line is not subjected to such wear and tear; however, if subsequent load growth along the feeder exceeds the current carrying capacity of the original conductor, making it necessary to reconductor the line by replacement of the No. 6 wire with a larger size, such as 4/0, then the useful service life and value of the original conductor has, in fact, depreciated through inadequacy to its remaining salvage value.

Sometimes an item of equipment in good operating condition depreciates in its useful value due to obsolescence. Assume, for example, that a given diesel plant contains a 1,000 kw generating unit only ten years old at the time when a new 2,500 kw unit is installed to handle system load growth. Due to the higher efficiency of the new unit, it is used to generate the bulk of system energy requirements, and the original unit is relegated to peaking or standby service, at a reduction in its original value for system operations.

In accordance with modern accounting procedure, there are four

SAMPLE CALCULATION OF DEPRECIATION COSTS

Item	Gross Plant Investment	Estimated Average Annual Depreciation Rate, Per Cent	Annual Depreciation Cost Charges
Internal Combustion Engine Production Plant:			
Structures and Improvements	$ 300,000	2.02	$ 6,060
Fuel Holders and Accessories	25,000	3.05	760
Internal Combustion Engines	450,000	3.48	15,660
Generators	200,000	3.44	6,880
Accessory Electric Equipment	220,000	3.43	7,550
Miscellaneous Power Plant Equipment	100,000	3.85	3,850
Sub Totals	$1,295,000	3.15	$40,760
Distribution Plant:			
Structures and Improvements	$ 70,000	2.23	$ 1,560
Station Equipment	210,000	3.15	6,620
Poles, Towers, and Fixtures	87,000	3.51	3,050
Overhead Conductors and Devices	85,000	2.65	2,250
Underground Conduit	65,000	2.10	1,370
Underground Conductors and Devices	98,000	2.52	2,470
Line Transformers	190,000	3.25	6,180
Services	55,000	3.36	1,850
Meters	90,000	3.33	3,000
Street Lighting and Signal System	65,000	3.81	2,480
Sub Totals	$1,015,000	3.04	$30,830
General Plant:			
Structures and Improvements	$ 85,000	2.15	$ 1,830
Office Furniture and Equipment	30,000	6.05	1,820
Transportation Equipment	37,000	14.83	5,490
Stores Equipment	10,000	4.82	480
Shop Equipment	11,000	5.43	600
Laboratory Equipment	7,000	5.75	400
Tools and Work Equipment	15,000	6.09	910
Communication Equipment	5,000	5.37	270
Sub Totals	$ 200,000	5.90	$11,800
TOTAL	$2,510,000	3.32	$83,390

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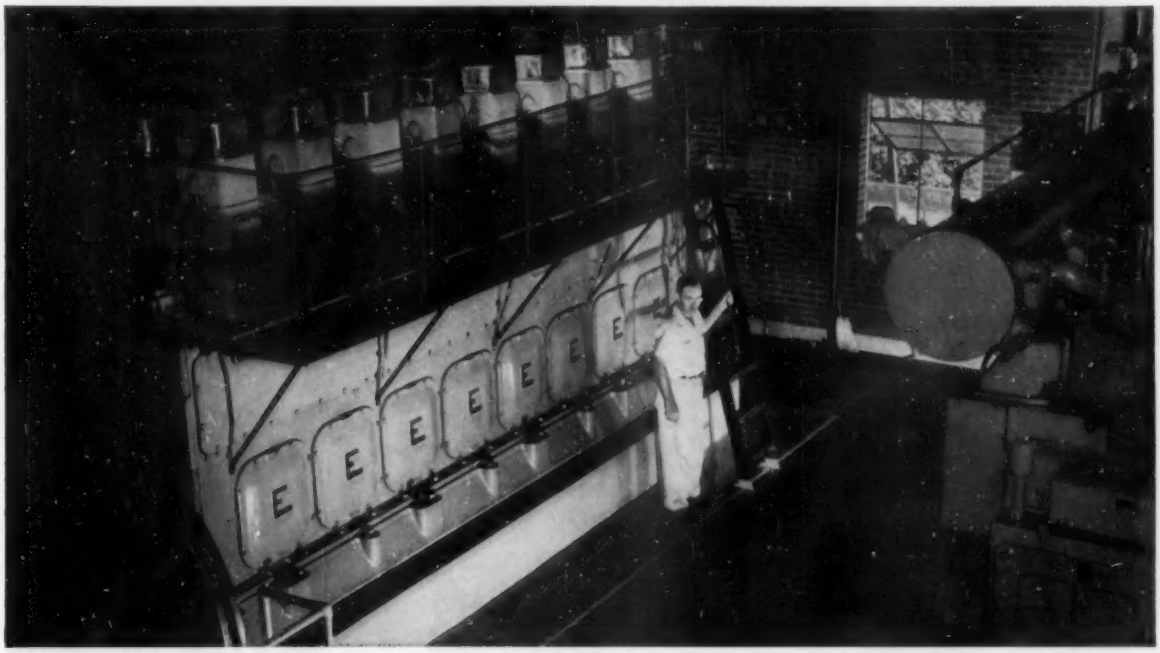

**Says Charley Hubbard, Plant Superintendent, El Dorado Springs, Missouri*

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Enterprise specializes in engines for stationary and portable electric power generation, flood and water pumping systems, and sewage plant power. Versatile fueling provides important operating economies. You can specify engines equipped for diesel, dual fuel, tri-fuel or spark-ignited gas. Models range from 73 to 7703 HP. For complete information and an expert analysis of your power plant problem, call your nearest Enterprise office or write us direct.

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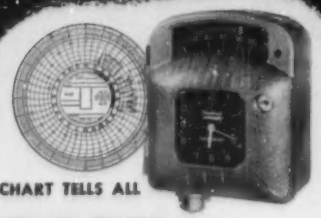

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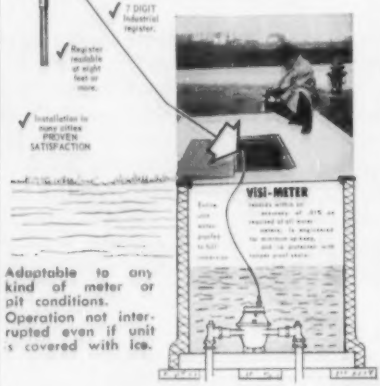
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methods in general use (as well as other methods in limited use) for accounting for depreciation, as follows:

1. Straight Line Method
2. Interest Method
3. Retirement Reserve Method
4. Revenue Method

According to information compiled by the Federal Power Commission in their 1951 publication of electric utility depreciation practices, by far the majority, or 89 percent of the reported utilities subscribed to the straight line method. In this method depreciation rates are based on the estimated average service life of individual items of property, with depreciation costs distributed by the straight line method in equal annual charges to operating expenses during the service life of the property items. Thus a distribution line transformer, costing $300, with an estimated service life of thirty years, would have a depreciation rate of 3.33 percent under the straight line method, and depreciation costs would accrue each year, during the thirty-year life of the transformer, in the amount of 3.33 percent of $300, or $10 annually.

To compensate for this expenditure of service life in the transformer, $10 should be credited each year from operating revenue funds to the depreciation reserve account. At the time of retirement of the transformer, this account should be charged with the book cost of the transformer and the cost of its removal, and credited with its salvage value.

During the year 1957 the composite average depreciation cost charges of Class A and B electric utilities in the United States (whose production plant equipment consists essentially of steam turbine generator type of units) amounted to 2.3 percent of gross plant and the depreciation reserve amounted to 18.9 percent of the plant value. Since various items and types of plant property and equipment are subject to varying rates of depreciation and years of service life, and since no two utilities are likely to have the same relative proportional investment among the items of property, it is apparent that an individual utility's weighted average rate of depreciation might be expected to vary somewhat from the national average of 2.3 percent; nevertheless, this figure might be considered as a

general practice datum when comparisons are drawn regarding the depreciation practices of a given utility having a steam production plant. Due to short service life expectancy for diesel engine equipment, an internal combustion engine plant's depreciation rate might be expected to exceed this figure considerably.

To illustrate the method of determining normal annual charges to be made for depreciation of a typical diesel electric utility plant, a sample calculation has been prepared, using average depreciation rate compilations from the Federal Power Commission publication mentioned hereinbefore. The rates of depreciation to be used for an individual system will vary, from the average values shown, in accordance with the estimates of service life expectancy for the given utility's plant based on operating practices, maintenance policies, and past experience with specific components of depreciable property peculiar to the system.

• • •

2½ Cubic Yard Bite

NEARLY 300 tons of refuse are handled during each 24-hour day, five days per week, at the Bostwick Avenue Incinerator Plant in Bridgeport, Connecticut.

This 2½-cubic yard bucket, made by Blaw-Knox Company, Pittsburgh, moves refuse from a pit to

hoppers feeding the two 150-ton per day furnaces. The furnaces are 15 feet in diameter and are mechanically stoked to produce a burning rate of 69.5 pounds per sq. in. per hour.

Richard H. Shannon, Director of Public Works for Bridgeport, says that only 32 men are employed on the three operating shifts at the plant.

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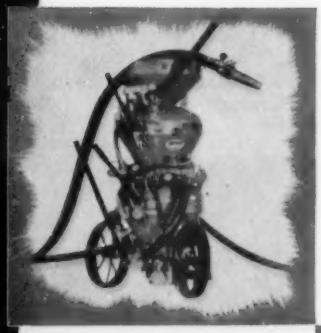

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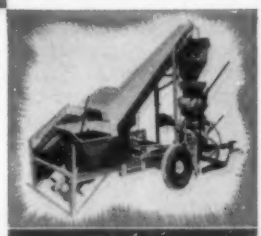

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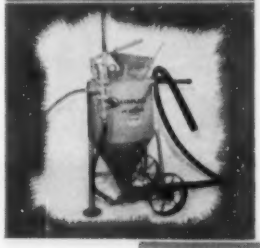

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● **THIS 2400-ft. bridge spanning New Jersey's Manahawkin Bay utilizes the new roadway lighting system which consists of fluorescent lights built in the railing.**

A UNIQUE new type of aluminum bridge railing that serves as a continuous lamp post has been unveiled by the New Jersey State Highway Dept. on the Route 72 Manahawkin Bay Bridge. The 4800 ft. of bridge railing, made by Michael Flynn Mfg. Co., has luminaires spaced 2 ft. apart along the top rail to give waist-high lighting.

The design for this novel system of roadway lighting was worked out by the Highway Dept. and is the result of an idea which State Highway Commissioner Dwight R. G. Palmer first conceived a decade ago.

In construction, the bridge railings measure 1½-ft. high and are mounted on a parapet that brings their overall height to 50 in. The top rail is elliptical in shape, measuring 7¾ in. by 5 in. Fluorescent luminaires measuring 42 in. long are recessed into cutout sections of this rail at intervals of 2 ft. These luminaires, which were designed and supplied by General Electric, are mounted so that all light is directed at the roadway, providing an even illumination of its entire surface. In addition to putting all the light where it belongs, this lighting system is very easy to service without blocking the roadway.

An aluminum sleeve that fits inside the top rail between the various sections protects electrical wires running inside the railing. This sleeve also acts as an expansion joint to compensate for thermal expansion and contraction between the rail sections.

● **CLOSE-UP of extruded aluminum bridge railing, showing how the top rung holds light fixtures and wires.**

Other dimensions for the Michael Flynn bridge railing are: 3-in. ips post, 2-in. ips lower rail and a 12-in. by 6-in. by ¾-in. base plate. The aluminum anchor bolts were also supplied by Flynn.

The entire Manahawkin Bridge railing was extruded, fabricated, assembled and welded by Flynn and shipped in sections to the bridge site where it was erected by Cornell & Co., Inc., Woodbury, N. J. under the general contractor, Conduit and Foundations of Philadelphia.

Light weight but strong, the railing does not require lift trucks or cranes for erection purposes. This Manahawkin railing was erected by two men, with wrenches as their principal tools.

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● **GRAVEL is bladed back on the shoulder, leveled with a berm-leveling attachment and immediately compacted in this shoulder maintenance operation. The work is continuous, as traffic soon cuts the berm down again. Unit is a Huber-Warco Maintainer with Berm-Leveler attachment, owned by the Michigan State Highway Dept.**

● ● ●

Grit Removal from Sewage

Using a Dorr Detritor, Cranston, R. I., removed an average of 1.65 cu. ft. of grit per million gallons of sewage during the fiscal year ending in September, 1958. Walter C. Anderson, Superintendent of the sewage treatment plant reports that the average moisture content was 7.15 percent and the volatile matter 1.81 percent.

Five Named ASCE Honorary Members

Five civil engineers have been named Honorary Members of the American Society of Civil Engineers. Those named were: Julian Hinds, of Los Angeles, one of the designers of the Colorado River Aqueduct; Major General Glen E. Edgerton, USA (Ret.), of Washington, D. C., former Governor of the Panama Canal and former president and chairman of the board of the Export-Import Bank of Washington; Frank Milton Masters, of Harrisburg, Pa., bridge builder; Gustav J. Requardt, of Baltimore, Md., sanitation and water supply engineer, of Whitman, Requardt and Assocs.; and Herbert Ashford Robertson Austin, of Honolulu, Hawaii, who currently is serving as consultant to the Territorial Commissioner of Public Lands on a multi-million dollar Honolulu waterfront.

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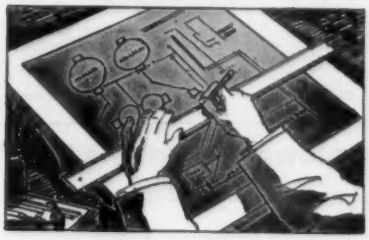

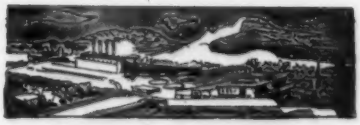

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Filter Hydraulics

(*Continued from page 97*)

about 18,000 gpm or a 21-inch rise per minute. However, a 21-inch rise backwash rate is considered inadequate for properly cleaning of the sand bed.

The computed results were checked and verified under actual backwashing conditions. At a 20,000 gpm rate, hydraulic performance of the wash water troughs and gullet was satisfactory. At a 25,000 gpm gullet at the upper end were flooded and part of the troughs completely submerged; while at the lower end (gullet outlet), the troughs were not flooded and performed as they should. Flooding of the troughs created unequal flow and distribution of waste water to the troughs and also uneven sand bed cleaning.

During the trial run at 25,000 gpm backwash, lateral movement and boils were noticed in the sand bed immediately under the wash troughs. The sand would rise vertically, strike the bottom of the rectangular wash troughs and move laterally in a swirling motion below the trough; thus creating sand boils and crevices beneath the troughs and leaving the sand bed rough and uneven.

The action of the sand bed is caused by the wash water trough bottom being too close to the sand bed. The bottom of the trough serves to dissipate the energy of the rising water, thereby creating lateral movement and eddy currents which scour the sand out from under the flat bottom troughs.

To overcome the objectionable factors, the proposed Dallas East Side Treatment Plant will be designed for V-Bottom wash troughs placed higher above the sand bed, with the gullet designed for a 36-inch rise per minute backwash rate with no flooding of the troughs. Experience with the V-bottom troughs installed in other plants has proven satisfactory. This type of trough will allow a more uniform increase in upward velocities in areas adjacent to the troughs, and also prevent lateral displacement of sand below the troughs.

The minimum distance to the bottom of the trough is considered to be a factor of sand bed expansion. Placement of a portion of the trough within the expanded zone will create eddy currents and lateral motion. Therefore, for 50 percent sand bed expansion, the minimum distance, above the sand bed at rest to the bottom edge of a V-trough,

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should be at least one-half the sand bed depth. Assuming 27 inches sand bed depth, the minimum distance to the bottom of the trough would be 13½ inches. The minimum distance for flat bottom troughs should be perhaps some few inches greater than one-half the sand bed depth to reduce the lateral movement eddy currents within the expanded zone.

The concept that the bottom of wash water troughs must be set at some predetermined distance above the sand without regard to other factors can hinder other functional requirements of filters. The problem of trough setting must be considered in all aspects of the maximum backwash rate, hydraulics of the troughs and gullet, and the physical dimensions required for proper operation. The latter may actually be the determining factors. If the gullet walls and wash troughs at the Elm Fork Plant had been raised 8 inches with the gullet width remaining the same, the filter wash troughs and gullet would not flood during backwash rates of 29-inch rise; and the bottom of the trough would have been 16 inches above the sand or slightly more than one-half the sand bed depth.

Variable demands and sustained operation at maximum loads has developed a trend toward need for greater flexibility in operation. Therefore, clear well storage is an important part of any plant. Greater needs are being placed on storage requirements.

Head loss is greatest at maximum loads. If the filters are to perform satisfactorily at maximum rates, the required head must be available. All hydraulic losses from the filters to the clear well must be carefully analyzed to establish the maximum level.

Pumping operations are of major importance and their relationship to the overall design of the treatment plant and clear well needs to be emphasized. Pump suction losses are greater than ordinarily recognized. Design of pump stations should be such that all of the storage may be pumped. Storage that cannot be pumped is a waste of capital investment.

Hydraulic conditions of backwash, wash water troughs, and the gullet must be analyzed thoroughly, and incorporated in a design which will permit the best operation under all backwash rates designed for.

Acknowledgment

The writer wishes to thank Ben L. Grimes, Supervisor, City of Dallas Water Purification Plants for

his able assistance and interest in conducting the various tests mentioned at the Bachman and Elm Fork Plants. The results have been beneficial to establish design criteria for the proposed East Side Plant.

This article is from a paper presented at the Texas Water and Sewage Works Associations' Short School, March, 1959.

• • •

Employee Safety Award

The North Carolina State Highway Commission has earned the Award of Honor from the National Safety Council for its employee safety record during 1958. This award is the highest citation given by the Safety Council and the North Carolina Highway Commission is one of the only six similar state agencies ever to have received it. The 1958 award went to only two states, North Carolina and Texas.

During 1958, the 15,982 permanent employees and prison laborers totalled more than 39 million man hours with an accident frequency record of only 6.49 accidents per million man hours worked. The North Carolina record was some 46 percent of the national average of 15.04 accidents per million hours, tabulated from other reporting Highway Commissions.

For several years the Highway Commission has maintained a safety training program for its employees. Established in 1947, the Commission now has over 5,200 persons qualified in first aid, along with 400 First Aid Instructors and 566 Advanced First Aid Students. First aid equipment is now installed in more than 100 Highway Commission vehicles. All of these mobile units are available to the general public and are frequently used in highway accidents and related mishaps.

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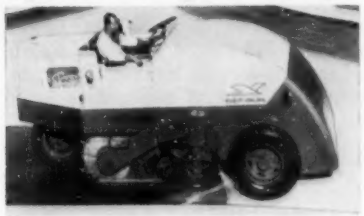
Eastern Metal announces two additions to their line of "A" stands. One unit has a large free-swinging, double-faced, 18 x 24-in. sign and the free-swinging feature gives excellent stability in high winds and traffic backwash. This stability is further increased by the use of legs on the frame. Another feature is the patented Speed-E-Loc which locks the stand in place by simply raising the lockpin; the stand folds flat for easy handling and storage. The second unit will fit the needs of many users who want a low-cost but durable, lightweight yet stable unit. This assembly, as with the other models, employs a bonderized welded steel "A" frame which supports a free-swinging, 18 x 18-in. steel sign for maximum stability. This model does not have the Speed-E-Loc and the sign is standard cut, not rounded. More complete data from Eastern Metal of Elmira, Inc., 130 Harrison St., Elmira Heights, N. Y., or circle **No. 8-1** on the reply card.

Elgin White Wing Street Sweeper



Latest addition to Elgin sweeper line

The Elgin White Wing combines both hydraulic and mechanical engineering principles and is rated as a 3-yard plus capacity machine. All the major elements of the sweeping mechanism are centered between the three wheels of the machine. This provides better driving visibility, weight balance, protection of the gutter broom and maneuverability. An exclusive feature is an 8-ft. wide sweeping path with its single side broom machine and a 10-ft. path if equipped with dual brooms. Complete data from Elgin Sweeper Co., Elgin, Ill., or circle **No. 8-2** on the reply card.

Ten gallon portable cooler is divided into two semi-circular compartments

Portable Water Cooler

The new 10-gallon cooler announced by Igloos, is the split-unit Texas-Type and is designed to comply with certain area regulations. It is available in the standard cooler, the heavy duty cooler and the stainless steel lined cooler series. All have the same size: 23¼ in. high, 15 15/16 in. in diameter with a 13-in. opening, and weigh 22 lbs. The interior is divided into two semi-circular portions, one for the ice and one for the water. A lid covers the water section and the spigot is tapped into the same side. Rolled hand grips, double locked seams throughout, Permalined inner liner, all steel fully corrugated, solid bottom support for inner container and recessed dripless spigot, are construction features of the unit. Complete details from Igloo Corp., Memphis 4, Tenn., or circle **No. 8-3** on the reply card.

Quick Release to Secure Portable Electric Plant

A new Quick Release base to secure a portable Kohler electric plant to its mount is now available from Kohler. This accessory is particularly useful where electric plants are attached to service trucks, emergency vehicles or construction equipment. The electric plant can be readily dismounted from the vehicle merely by loosening the four-arm handle. The base is available with Kohler 500, 1500 and 2500-watt portable models. For more data write Kohler Co., Kohler, Wis., or circle **No. 8-4** on the reply card.

Weatherstripped Door Stop

The Seal-Draft weatherstripped door stop consists of a featheredged vinyl sealer imbedded into the body channel, and designed to flex with door operation to create a tight weather proof seal. The body is permanently affixed to the wood or metal door jambs with stainless steel screws and can be used either as a weatherstripped door stop on straight jambs, or as a weatherstripping on rabbetted jambs. More data from Seal-Draft Div., Sun Screen Products, Inc., N. 2220 Division St., Spokane 21, Wash., or circle **No. 8-5** on the reply card.

Aerial Platform Units For Globe Cleaning and Lamp Replacement

Three Strato-Tower Series LST hydraulic aerial platform units are now available for street light maintenance. These units provide a working height of 35 ft. and are designed for two-man, maintenance and driver operation. The specially designed utility body features compartments for both new lamp stock and for convenient disposal of used and broken lamps. There are many new features of design to give the crew facilities for efficient, economical operation. Complete specifications from Strato-Tower Div., Young Spring & Wire Corp., P. O. Box 103, Elkhart, Ind., or circle **No. 8-6** on the reply card.

Units designed for two-man operation

Low Cost Highway Widener

Power-Pack widener will spread most any type of material

Power-Pack Conveyor announces the addition of a new machine, Model 605, to their line of power-operated back-filler and road widening equipment. The unit is designed for spreading road widening material such as sand, stone, aggregate or hot-mix. It quickly attaches to any truck by means of two cables which extend under the truck and hook to the front bumper. Tensioning jacks position the machine snugging the rear wheels of the truck against the conveyor bumper rolls. The strike-off blade is adjustable to any width from 2 to 5 ft. and hand screws control the raising and lowering of the curved strike-off blade, permitting a constant grade up to 5 ins. above or below the surface. A quick adjustment of the hand screws will adjust the blade to hold a set shoulder slope. For additional information write Power-Pack Conveyor Co., 836 East 140th St., Cleveland 10, Ohio, or circle **No. 8-8** on the reply card.

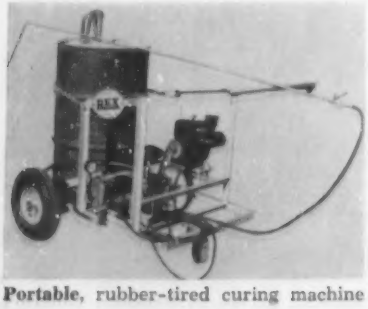
Loader and Backhoe Units

International Wagner loader and backhoe for IHC tractor

The International Wagner No. 465 loader and No. 65 backhoe, built for sustained heavy-duty loading and trenching operations, now are available for use with the new International T-340 crawler tractor. With a rated capacity of 3,500 lbs. at full lift, the low profile 465 loader features an automatic hydraulic self-leveling action which enables the bucket to return from full dump height to a preset digging angle, using boom control only. Its 64-in. wide bucket has a capacity of ⅝ cu. yd. struck to ⅞ cu. yd. fully heaped. Equipped with reinforced box-type boom and dipperstick, the International Wagner 65 backhoe digs and maintains trench grades up to a depth of 10 ft. It can dig efficiently at right angles to the tractor, with a full 180° arc of swing. The International T-340 is a 31 drawbar hp crawler powered by a 4-cylinder gasoline engine with 135-cu. in. displacement. Complete details from Consumer Relations Dept., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., or circle **No. 8-10** on the reply card.

Portable Spray Curing Machines

Two Rex portable spray curing machines for use in limited or off-slab areas have been announced by Chain Belt. One unit is a rubber-tired model with a mounting platform for a 55-gal. drum. The other is a hand-carried model with a steel base plate and convenient lifting handles. Both models are equipped with: Single cylinder, 4-cycle air-cooled gasoline engine; positive displacement pump with an automatic by-pass that returns unused material to the drum; hardened, stainless steel spray nozzle; lightweight, 10-ft. wand for long reaches; and a 25-ft. connecting hose that permits the operator to work more extensive areas between machines. For complete details write Chain Belt Co., Construction Machinery Section, Milwaukee 1, Wis., or circle **No. 8-7** on the reply card.



Portable, rubber-tired curing machine

Photo copying machine is easily used by all personnel and performs efficiently under all normal office light

Machine Reproduces Anything Printed

An attractive new model Genco Porta-Fax photo copying machine, made by General Photo Products, automatically exposes, processes and prints 60-120 sharp, error-free copies per hour. It reproduces anything printed or written up to 9¼ in. wide by any length, including colors and ball point pen, and may be used for duplicate copies from one negative, two-sided copies, color-coded sheets and transparencies. Completely self-contained it weighs only 15 lbs., measures 18 x 6 x 10 in. high, and is equipped with a carrying handle for complete portability. For further information write General Photo Products Co., Inc., General Photo Building, Chatham, N. J., or circle **No. 8-9** on the reply card.

Auburn Trencher

A new model Auburn Gear-Draulic trencher for International 340 and 460 utility tractors is announced by Auburn Machine. The trencher will dig at widths from 6 to 14 in. and at depths to 6 ft. It will dig up to 800 ft. of trench per hour. The unit features a non-clogging digging ladder with alternate right and left cutting teeth that cut the trench and lift the dirt to ground level where augers convey it to both sides of the trench. Interchangeable digging chains and booms are available to accommodate various widths and depths of trenches desired. Complete details from Auburn Machine Works, Inc., Auburn, Nebr., or circle **No. 8-11** on the reply card.

Stabilization Plant

A Model 824 stabilization plant has been added to the Barber-Greene line of stabilization equipment. This portable plant is capable of capacities of up to 300 tph, depending upon the type of materials and applications. Some of the advantages of this central plant and material handling system are: Positive and accurate control of proportioning of all materials; uniform mixing; materials are handled, mixed and brought to the laying site with the minimum amount of segregation and evaporation; and the central plant set-up lends itself to better control and more efficient feeding of materials. Among the many agents that can be successfully handled include: water, cement, fly-ash, bitumen, chlorides and emulsions. Many local aggregate materials such as crushed stone, gravel and sand as well as clay and soil can be used. Complete details from Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill., or circle **No. 8-12** on the reply card.

Hubbed High Density Polyethylene Pipe

The new pipe, called Pi-Mar S (Sewer) and D (Drain) is unique in that the hubbing is an integral part of the pipe, which eliminates the need for a separate coupling. It is easy to install, can be cut with a handsaw, no special tapering tools are required, and no adhesives. Impervious to waste acids and alkalis, this pipe will not rot, rust or corrode, and will not fracture. This pipe is available, also, in double-hubbed lengths. The hubbed sewer pipe is made in 2, 3 and 4-in. sizes and the hubbed, slotted drain pipe in the same diameters. Both sewer and drain pipe can be made in 20-ft. lengths, or in special lengths. Complete details from Pyramid Industries, Inc., Erie, Pa., or circle **No. 8-13** on the reply card.

Hubbed polyethylene pipe being laid. No adhesive or separate couplings are needed to lay this type of sewer pipe

Portable auger drill digs holes up to 12 in. in diameter and 40 in. deep

Portable Auger Drill

A new, improved portable auger drill which is capable of drilling a hole a minute in average soil has been announced by J. R. Prewitt. The auger weighs 525 lbs. and has pneumatic tires and roller bearing equipped wheels for easy moving from job to job. The feed screw and auger fold over during transportation. It will bore holes 4 to 12 in. in diameter and up to 40 in. deep in most soils. It is designed so that weight transfers to or from the auger cutter instantaneously with complete safety to the operator. One man can accomplish all drilling operations unassisted by means of simple, convenient control levers. For further information write J. R. Prewitt and Sons, Dept. R, Pleasant Hill, Mo., or circle **No. 8-14** on the reply card.

Bulldozers For Traxcavators

Angling blade bulldozers for all models of Cat-built Traxcavators, designed for greater maneuverability, better operation in restricted areas, and increased visibility for the operator, have been announced by Balderson. The new dozers may be angled right or left, or used in straight position for complete versatility. The blades are quickly interchangeable with Traxcavator buckets, either front or side delivery. Visibility is excellent, an important safety factor in operation. The breakout action of the Traxcavator controls, insuring fast positive tilt and pitch, makes the new Balderson blades ideal for dozing in rough areas. For further information write to Balderson Inc., Wamego, Kan., or circle **No. 8-15** on the reply card.

Folding Handle Electric Eel Sewer and Drain Cleaner

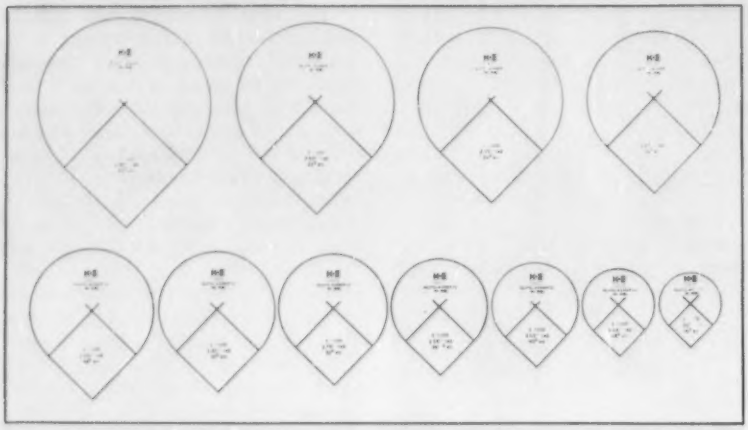
The new folding handle electric eel sewer and drain cleaner is an extremely compact, easily portable machine designed to handle a wide variety of cleaning jobs. The handle can be raised to operating position or folded to transport or storage position without adjustment of any kind. The unit itself can be used on lines from 3 to 12 in. in diameter and will run up to 250 ft. The motor is of the condenser type—is back-geared 3 to 1—and is equipped with a rugged slip clutch that is mounted directly to the back geared shaft. The cable is of dual construction and consists of an inner member wound left-hand and an outer member wound right-hand. All manual handling of the cable is eliminated and the machine is safe to operate. The two cable members are also tied together so that if one member should break, the entire cable can still be pulled readily from the line. Convenient 8-ft. cable sections with instant, snap lock connectors permit work in small spaces. For further data write The Ohio Tool and Engineering Co., 953 Spring St., Springfield, O., or circle **No. 8-16** on the reply card.

Kelley Power Tampers

Two Power Tamper Models, one with an 18-in. shoe and the other with a 30-in. shoe, now are being offered by Kelley Machine. These portable, gasoline - engine - driven tampers are used for fast, efficient vibratory compaction of granular soils and bituminous surfacing mixtures. In one minute, they make 2400 continuous tamping cycles and propel themselves forward up to 60 ft. with the compacting force of a 12-ton roller. Both models can be fitted with exhaust heater shoe attachments for use on asphaltic mixes. More details from Kelley Machine Div., Wiesner-Rapp Co., 285 Hinman Ave., Buffalo, N. Y., or circle **No. 8-17** on the reply card.

Tampers can be used on asphalt mixes

Tear Drop Curves Simplify Road Layout Work

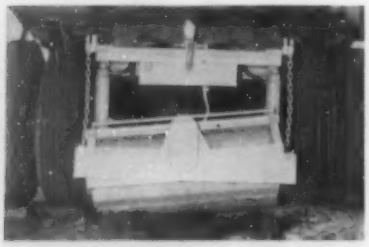


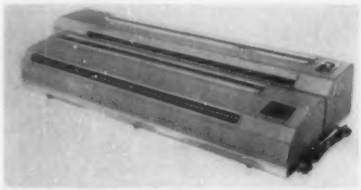
Templates simplify short radius work in any layout that involves circles and arcs

Tear drop curves that greatly simplify highway interchange design have been introduced by Keuffel & Esser. Especially effective in short-radius work such as limited-speed controls, exits, entrances, and acceleration/deceleration lanes, the new curves can be used in any layout work involving circles and arcs. All curves in this new series have double tangents, two radial lines and a hole for marking the center of arc. They can be used on drawings to any scale. Using the double tangents, curves tangent to a line can be drawn in four directions without removing the curve from the drawing. In addition, curves as long as 270° can be drawn in one operation. Made of transparent, durable Luxylite, the new Tear Drop Curves are available in complete sets as radius or degree curves to the arc definition, eleven curves to a set. For additional information write Keuffel & Esser Co., Adams and Third Sts., Hoboken, N. J., or circle **No. 8-19** on the reply card.

Tiltable Roller For Road Patching

A new road patching roller that is mounted under the frame of a truck and can be lowered to roll a smooth, permanent asphalt patch is announced by Martin Co. The Tiltable Patcher is raised or lowered by an electrically-operated hydraulic pump. It makes a permanent road repair by using a controlled compaction pressure maintained by hydraulic pressure against the weight of the truck. It is a completely self-contained unit and has two spring-tensioned scraper blades and a built-in sprinkler system that lubricates the roller. Complete data from Martin Co., P. O. Box 372, Kewanee, Ill., or circle **No. 8-18.**





Combination photocopy machines can make, with a single sheet, copies of blueprints 26 in. wide by any length

27½-in. Wide Copier

A new 27½-in. photocopy exposure and processor is announced by Rovico. It is designed to meet the needs of engineering and reproduction departments to copy drawings, blueprints, maps and other large records and documents. Anyone with Diazo type equipment need only purchase the processor, for the new Rovicopy paper has an emulsion which makes it suitable for exposing in Diazo type machines (with yellow diffusion filter) and in projection cameras. For full details write Rovico Inc., 318 Market St., Newark, N. J., or circle **No. 8-20** on the reply card.

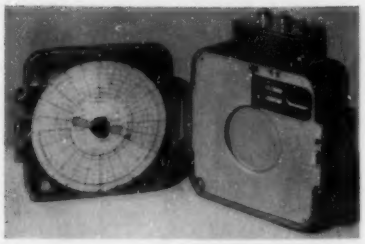
Trash Rack Rake Clears Clogged Water Intakes

A new trash rack rake, which helps reduce head and power losses resulting from clogged water intakes, is now available from Allis-Chalmers. The rake is used on all kinds of stationary intake rack structures which have either inclined or vertical rack bars. One of its outstanding characteristics is its ability to ride down over stubborn obstructions and work them free. Easy cleaning of the bars is possible because no guides at the rack bars are needed. An electric hoist raises and lowers the rake. More data from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., or circle **No. 8-21** on the reply card.

Transistorized Two-Way Radio Equipment

An advance design of transistorized two-way radio equipment containing the highest powered transistorized models, the smallest sizes and the lowest battery drain ever to be made commercially available in the mobile communications field is announced by General Electric. It will be available in units up to 75 watts and the line ranges downward to 30 and 10-watt units in sizes as small as 8⅝ in. wide, 12 in. long and 4 in. high. Only three tubes are used in lower wattage categories and four in the higher models. Among engineering techniques which help conserve power is the elimination of power-wasting crystal ovens with no loss in frequency stability. The smaller size unit will fit under the dash of a car and more leg room is gained. In many vehicles, new mounting flexibility is achieved because the user has the option of placing the unit under the seat or in various other locations out of the way but still accessible for inspection and maintenance. Units will be available in both narrow band, for new licensees, and wide band, for replacement use in existing communication systems where desired. The equipment has provisions for either 12-volt or 24/12-volt power supplies. For further information write Section P., General Electric Communication Products Dept., P.O. Box 4197, Lynchburg, Va., or circle **No. 8-22** on the reply card.

Radio has very little "standby" drain



Recorder can be mounted anywhere in cab for it does not have to be seen

Multi-Purpose Speed Recorder

Lugging and overdriving can be reduced drastically on off-the-road equipment and other rolling stock with the use of the Service Recorder Company's new multi-purpose speed recorder. It makes an accurate record of engine speed in revolutions per minute and pinpoints operations on one-day or three-day charts. An accompanying indicator is set to flash warning lights if the engine reaches too high, or too low, revolutions per minute. The recorder can be mounted anywhere in the cab because it does not have to be visible to the driver. With this feature, the tachometer need not be disconnected. The rpm warning unit can be mounted on top of the recorder and attached to the dash, or they can be separated, moving the recorder to any convenient place and the indicator alone mounted within the driver's field of view. For complete details write The Service Recorder Co., 1013 Rockwell Ave., Cleveland 15, Ohio, or circle **No. 8-23** on the reply card.

Outdoor Fluorescent Lighting Fixtures

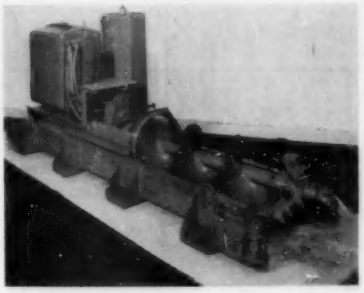
A new line of outdoor fluorescent lighting fixtures for illumination of streets, expressways and shopping centers has been introduced by Metalcraft Products. Called the "Broadstreeter," the aluminum, fully-weatherproofed fixture is designed to provide more light per watt with less glare. It is available in 4 and 6-ft. sizes and the aluminum body is heliarch seam welded to cast aluminum ends, and the gasket-sealed acrylic diffuser creates a rust-proof and bug-proof fixture. The fixture is designed for the latest high wattage lamps and standard high output lamps. It is a 110-125-volt, 60-cycle operation, and is available for operation on other voltages. The units are union wired. Complete data from Metalcraft Products Co., Inc., Philadelphia 35, Pa., or circle **No. 8-24** on the reply card.

Pipe Repair Clamp

An improved heavy duty Patchmaster pipe repair clamp has been announced by Marman Division. Made for pipe sizes from ½ through 8-in. and in widths of 3, 6, 9 and 12 in. the new Patchmaster easily and quickly repairs pipe leaks, either in an emergency or permanently. The new lug design allows the pipe repair clamp to conform to the contour of the pipe under high torque without biting into the pipe. The Buna N pad will withstand high clamping pressures without extruding. Further data from the Advertising Dept., Marman Div., Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif., or circle **No. 8-25** on the reply card.

Trip Blade Snow Plows

The new plow announced by Wausau features a tripping subframe which clears obstructions without damage to plow or truck. Its advantage over a tripping cutting edge is its ability to trip even though the cutting edge is worn down. Other features of this new series of reversible and one-way trip plows are: Full oscillation to follow road contour; easy adjustment for moldboard pitch; and adjustable push plates to compensate for difference in truck frame heights. More details from Wausau Iron Works, Wausau, Wisc., or circle **No. 8-26.**

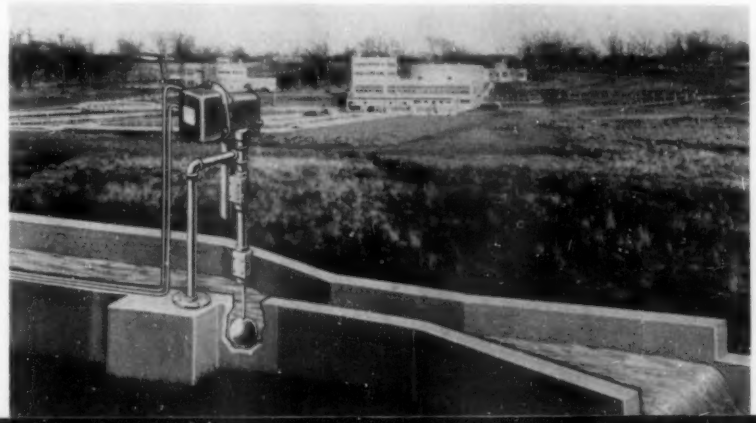


Trench Drills

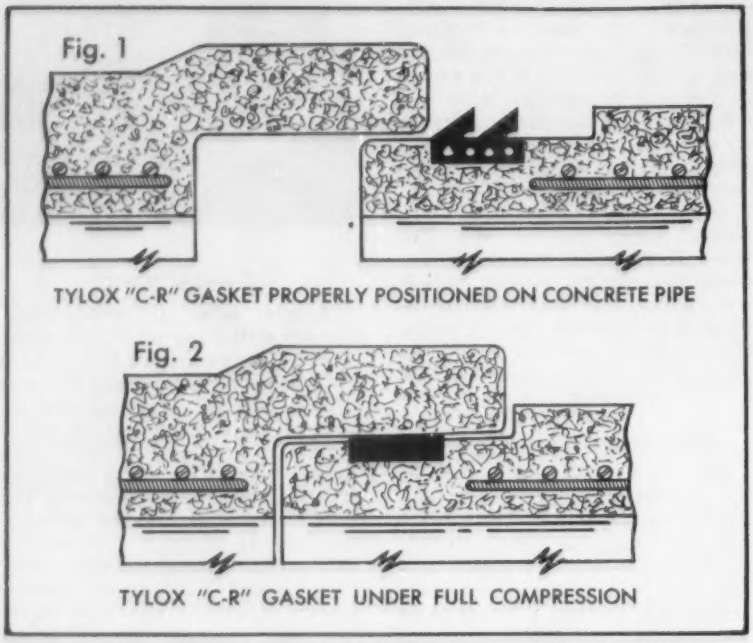
A new series of trench drills capable of drilling 400 ft. and pushing pipe as far as 250 ft. has been introduced by Salem Tool. The unit (Model 24-TD) is being used by contractors and utilities to install water, gas and electric lines under streets, highways and railroads without cutting the pavement. The unit is also being used in dewatering jobs of all types. The drill is powered by a 52-hp gasoline motor; has 4-speed transmission; electric starting; forward thrust of 30,000 lbs.; and maximum torque at the auger of 6,500 ft. lbs. It is equipped with variable hydraulic feed in a rigid frame for drilling accuracy. Pipe pusher and one guide are standard equipment. More details from The Salem Tool Co., Salem, Ohio, or circle **No. 8-27** on the reply card.

Transmitter Measures Water and Sewage Flow

Builders-Providence has announced a new in-stream type Chronoflo transmitter for water and sewage departments. Installed on Parshall flumes, weirs or other head-area devices for measuring rates of flow of water or sewage in open channels, the new transmitter is in-stream actuated. It utilizes a float arrangement with the 6-in. expanded polystyrene float riding directly in the channel at the proper metering location. Because the float motion is vertical, no radial correction is required. The transmitter eliminates the stilling well and it also eliminates the need for flushing systems, float well cover, connecting piping, sediment tanks, blowdown valves and frequent cleaning. All parts are corrosion-resistant for trouble-free operation. For further information write to B-I-F Industries, 345 Harris Ave., Providence 1, R. I., or circle **No. 8-28** on the reply card.



Tylox "C-R" Rubber Gasket For Recessed Pipe

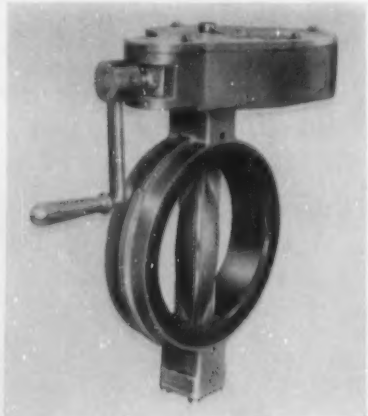


Wide, flat rubber "pack" formed by Tylox "C-R" gaskets cannot be rolled or twisted

A new rubber gasket for recessed sewer pipe which cannot roll or twist out of position during pipe coupling operations is announced by Hamilton Kent. This is the "Snap-on" type, designed for use with recessed tongue and groove or bell and spigot pipe of all sizes; either rubber or neoprene may be used and the gasket can be applied to pipe either at the plant, or by the contractor at the job site. This seal is capable of withstanding head pressures up to 50 ft. The gasket consists of heavy base bands of rubber having integrally formed, multiple sealing fins, and specially designed pressure pockets. Complete data from Hamilton Kent Manufacturing Co., 427 West Grant St., Kent, O., or circle **No. 8-35** on the reply card.

Butterfly Valve

A rubber seat butterfly valve has been announced by the Henry Pratt Co. The Monoflange Mark II butterfly valve will feature numerous technical innovations and is being offered for 150 psi tight shutoff in sizes 4 through 20 in. A wide range of material trim and valve actuators for manual or automatic operation are available. Contact the Henry Pratt Co., 319 West Van Buren St., Chicago 7, Ill., or circle **No. 8-29** on the reply card.



Valves come in sizes from 4 to 20 in.

Batching Plant on Wheels

A portable concrete batching plant, available from the Noble Co., can be moved from job to job. The plant has storage for aggregate and cement. One man can operate the plant and virtually all controls are push button. Slump can be controlled to rigid job specifications. More information is available from the Noble Co., 1860 Seventh St., Oakland 21, Calif., or circle **No. 8-30** on the reply card.

Tandem-Axle Construction Trucks

The complete new line of White tandem-axle construction trucks are custom engineered by White to provide maximum payload and durability in materials-hauling operations. The trucks are offered in four model designations, both gas and diesel, from 35,000 to 75,000 pounds GVW. Complete data from The White Motor Co., 842 E. 79th St., Cleveland 1, O., or circle **No. 8-31** on the reply card.

Rotary Pipe Cutter

Easy portability, fast one-man operation and clean, accurate cuts are features claimed for a line of new rotary four-wheel pipe cutters designed for large steel and cast iron pipe from 12 to 24 in. in diameter. The new device available from Reed Mfg. Co., consists of a separable circular frame joined at the midsections by hinged screws and adjusting nuts. An aluminum handle is placed successively over the eight lugs on the outside of the frame and the same handle is used to tighten the cutter as cutting proceeds. The 16-in. size weighs 51 lbs. complete and all of the units separate into three easily carried parts. A minimum of digging is required since the four-wheel design requires no more than 45° to 60° of handle swing, and only a 6 to 8-in. channel is needed under the pipe. Since the cutter is manually operated, it requires no power source and creates no explosion or electrical hazards, even when used in mud or water. For complete details write to Reed Mfg. Co., Erie, Pa., or circle **No. 8-32** on the reply card.

Pipe guide automatically alines the cutter for a right angle cut. Cutter can be manually operated by one man

Loader is available from Henry and is designed for utility tractors and has a breakaway capacity of 2500 pounds

Economy Loader Announced

A new economy loader, the L-100 Series, has been added to the line of earth moving equipment produced by Henry Mfg. These loaders have been designed for mounting on utility tractors and have a breakaway capacity of 2500 lbs. Model L-100S has one bucket cylinder and Model L-100D has two bucket cylinders. Double acting lift and bucket cylinders are standard on both models. Adapter brackets are provided to mount the loaders on International Harvester, Allis-Chalmers, John Deere, Ford, Ferguson, Massey-Ferguson, Oliver and Case tractors. Complete details from Henry Mfg. Co., Inc., P. O. Box 521, Topeka, Kans., or circle **No. 8-33** on the reply card.

Manhole Meter Offers Easy Installation

Unique design of the Sparling Saddle Meter Type 906 permits it to be installed quickly and easily on steel cylinder or reinforced concrete pipe in sizes from 16 to 72-in.

Meter is propeller type and may be installed at any convenient angle in full flowing suction or discharge line

The assembly slides directly through the opening of the pipe's standard flanged section or manhole opening and bolts easily into position ready for immediate service. The meter is the propeller type and may be installed at any convenient angle in a full flowing suction or discharge line. Total flow is registered on a 6-digit straight reading totalizer, reading in standard units. The meter comes complete with saddle, gaskets, bolts and straightening vanes; or meterhead only with gasket and bolts. For complete data write Sparling Meter Co., 225 N. Temple City Blvd., El Monte, Calif., or circle **No. 8-34** on the reply card.

NEWS OF ENGINEERS

A. J. STEFFEN, Sanitary Engineer for Wilson & Co., Chicago, Ill., has been appointed Chairman of the American Meat Institute Sanitation Committee.

F. L. HOTES heads a Division of Water Resources Development of Engineering-Science, Inc., Consulting and Research Engineers, Pasadena, Calif. Also, a new office has been opened in Oakland. HARVEY F. LUDWIG is President of Engineering-Science, Inc.

LAWSON D. MATTER, Chief of the Water Supply Section of the Pennsylvania Dept. of Health, retired June 30 after 40 years of service. He has been outstanding in the field of public water supply and has been the recipient of many honors.

DR. FRITZ SULZER has been appointed as Assistant Professor of Sanitary Science in the Department of Sanitary Engineering of the School of Public Health, University of North Carolina, Chapel Hill. Since 1955, Dr. Sulzer has served as a Research Fellow at the Swiss Federal Institute for Water Supply and Sewage Purification, working on the microbiology of activated sludge, water disinfection and related subjects.

After 50 years of continuous service as a municipal engineering consultant, C. ROBERT FULTON has retired from active participation in the firm of Fulton & Cramer, Lincoln, Nebraska. James D. Kissell and Marvin L. Garber, long associated with the firm, together with John W. Cramer, will comprise the new partnership which will continue to offer the same service as in the past.

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1—Baily Steam Flow Meter. Pressure standard—800 psig, maximum capacity 35,000 lbs. per hour, complete with draft, damper controls, and gauges.
1—Fairbanks-Morse Electric Boiler Feed pump. 1½" suction, 25 hp, 2920 rpm.
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INDEX OF ADVERTISEMENTS

Adams Co., Inc., R. P. 50
Aeroquip Corporation 58
Air Placement Equipment Company 213
Alabama Pipe Co. 51
Allied Chemical Corp. 54
Solvay Process Division
Allis-Chalmers ..... 16, 17, 37, 39, 41 & 87
Aluminum Company of America 32
American Cast Iron Pipe Co. 201
American Public Works Association 173
American Playground Device Company 46 & 230
Aurora Pump Division 155
New York Air Brake Company
Austin-Western 169
Construction Equipment Division
Automatic Signal Division 65
Eastern Industries, Inc.
Ayer-McCarel Clay Co., Inc. .....12 & 13

Badger Meter Mfg. Company 183
Baldwin-Lima-Hamilton 68
Baughman Mfg. Co. 168
Bethlehem Steel Company .....62 & 63
Bowerston Shale Co. .....12 & 13
Brockway Motor Trucks 40
Div. of Mack Trucks, Inc.
Bros Incorporated 528
Brown Company 76
Bucyrus-Erie Company 149
Burgess-Manning 160
Penn Instrument Div
Butler Manufacturing Company 55

Calgon Company 189
Cannelton Sewer Pipe Co. ..... 12 & 13
Case Company, J. I. ..... 66 & 67
Cast Iron Pipe Research Assoc. ..... 8 & 9
Cataphote Corporation 89
Caterpillar Tractor Co. ..... 4 & 92
Caterpillar Tractor Company 64
Engine Division
Centriline Corporation 190
Chain Belt Company 199
Chicago Bridge & Iron Co. ..... Third Cover
Chicago Pump Co. 3
City Tank Corporation 141
Clark Company, H. W. 192
Clark-Wilcox Company 206
Neico Division
Classified Ads 227
Cleveland Trencher Company 136
Climax Engine Mfg. Co. 14
Division of Waukesha Motor Company
Combustion Engineering ..... 84 & 85
Corrosion Control Co., Inc. 44
County Chemical Company 140
Cutler-Hammer Inc. 38

Darby Corp., The 184
Darling Valve & Mfg. Co. 205
Deere, John 77
Industrial Division
Dempster Brothers 52A
Diamond Alkali Company 167
Dickey Clay Mfg. Co., W. S. ..... 12 & 13
Dorr-Oliver Inc. 191
Douglas Fir Plywood Association 90 & 91
Dow Chemical Company 145
Drett Manufacturing Company ..... 82 & 83

Earthworm Boring Machine, Inc. 146
Econ-O-Way Inc. 142
Elmco Corporation 22
Enterprise Engine & Machinery Company ...211
Subsidiary of General Metals Corp.

Fabri-Valve Company of America 53
Fischer & Porter Company ..... Second Cover
Fisher Research Lab., Inc. 51
Fitchburg Engineering Corp. 143
Flexible Inc. 152
Flex-O-Lite Mfg. Company 15
Ford Meter Box Company, Inc. 186
Ford Motor Company ..... 34, 35 & 139
Ford Motor Company 165, 166
Tractor & Implement Div.
Forneys Inc. 86
Foxboro Company 203
Fox River Tractor Company 49
Frink Sno-plows, Inc. 88

Gar Wood Industries, Inc. 157
General Electric Company ..... 69 to 72
Georgia-Pacific 59
Gledhill Road Machinery Co. 177

Hamilton Kent Mfg. Co. 81
Healy-Ruff Company 86
Hersey Mfg. Co. 79
Horton Equipment Company 158
Hough Company, Frank G. ..... 74 & 75
Hydro E-Z Pack 136
Division of Hercules Galion Products, Inc.

Infilco Inc. 42
International Harvester Company 45, 82 & 83
International Salt Company 18

Jeffrey Manufacturing Company 161
Johns-Manville 60

Kaiser Aluminum & Chemical Sales Inc.. 149
Katolight Corporation 140
Keasbey & Mattison 23
Kelly Machine Division 146
The Wiesner-Rapp Co., Inc.
Kerrigan Iron Works, Inc. 181
Komline-Sanderson Engineering Corp. 153
Koppers Company, Inc. 159
Tar Products Division

Link-Belt Company 10
Littleford Bros., Inc. ..... 19 & 20

M-B Corporation 140
M & H Valve & Fittings Co. 200
Marman Division 58
Aeroquip Corporation
Massey-Ferguson Industrial Division 29
Master Builders Company 163
Division of American-Marietta Co.
McCabe-Powers Auto Body Company 175
McCormick Sand Div., William J. 146
Minnesota Mining & Manufacturing Co. .. 11
Miro-Flex Company, Inc. 172
Monarch Road Machinery Company 142
Morton Salt Company 25
Mueller Co. ..... 61 & 73

Natco Corp. ..... 12 & 13
National Clay Pipe Mfrs., Inc. 21
Newark Brush Company 138

Oliver Corporation 147
Orangeburg Mfg. Co., Inc. 154

Pacific Flush Tank Co. 151
Pacific Mercury 230
Phelps Dodge Refining Corp. 188
Pipe Linings 194
Div. of American Pipe & Construction Co.
Pomona Terra-Cotta Co. ..... 12 & 13
Portland Cement Association 65
Public Works ..... 48 & 176

Recordak Corporation 197
Subsidiary of Eastman Kodak Co.
Ridge Tool Company 52
Roberts Filter Mfg. Co. 212
Rust-Oleum Corporation 57
Rynal Corporation 80

Seaman-Andwall Company 171
A Subsidiary of American-Marietta Co.
Shell Chemical Corp. .....30 & 31
Sika Chemical Corporation 195
Div. of Pfaudler Permutit Inc.
Simplex 185
Sprague & Henwood Inc. 51
Stanco Mfgs. & Sales Inc. 202
Standard Dry Wall Products, Inc. 144
Standard Steel Works, Inc. 174
Steel Plate Fabricators Assoc. 187
Sumo Pumps Inc. 204
Synchro-Start Products Inc. 48

Tampo Mfg. Comapny 78
Tarrant Manufacturing Company 24
Tennant Company, G. H. 32
Tennessee Corp. 53
Texas Vitrified Pipe Co. ..... 12 & 13
Thompson Pipe & Steel Company 86
Trickling Filter Floor Institute ..... 12 & 13

Union Metal Mfg. Company 47
U. S. Pipe & Foundry Co. ..... 26 & 27

Vermeer Manufacturing Company 170
Vibro-Plus Products, Inc. 179
Visi-Meter, Inc. 212

Wagner Electric Corporation 212
Walker Process Equipment Inc. 6
Wallace & Tiernan Co., Inc. ..... Back Cover
Warren-Knight Company 206
Washington Aluminum Company, Inc. 46
Wausau Iron Works 56
Wilkinson Products Company 202
Wood Company, R. D. 193
Woodward Iron Company 209
Wyandotte Chemicals 180
Michigan Alkali Division

Zimmer & Francescon 6

CONSULTING ENGINEERS APPEAR ON PAGES 215 to 220

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WORTH SEEING

"Priceless Water," a 16-mm movie that tells the story of the Rahway, New Jersey, water supply in color and sound, has been produced for the AWWA as the first of a series in the new AWWA Water Works Advancement program. The local film project is designed to bring about better understanding of the needs for advance planning for future water supply. Shown with the cameraman are James F. Roosevelt, Rahway's City Administrator, and Herman Klenner (right), water superintendent. In the background is Rahway's filtration plant.

Two jobs, building small erosion dams and supplying concrete for bridges along a new section of highway, are assisted by this International 340 Utility tractor with loader and scraper. Unit loads aggregate at the portable concrete batching plant and the scraper handles grading before the dams are placed in the ditches, later does the final grading and general cleanup work in medial strip.

Filming the fight waged against a blustering storm by city departments and utilities in Rochester, N. Y., a cameraman adds footage to a half-hour TV documentary. Super-sensitive Kodak Tri-X movie film made the job possible despite the poor conditions.

Part of a 60-mile water transmission line for the San Diego County Water Authority, these 32-ft. sections will be joined by a rubber gasket joint developed by Kaiser Steel. The concrete and steel pipe sections were made by Kaiser's Fabricating Division plant.

"On the road to make a road" is the new portable concrete batching plant built by Erie Strayer Co. It can be off the road and in business within three hours. Conveyor structure over lead vehicle is 40 ft. long. Photo courtesy B. F. Goodrich.

WRITE FOR LITERATURE

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Manufacturers of the Thomas Electronic Organ

by Arthur K. Akers

★ July 1, 1959, marked the 10th anniversary of "CIMA," the Construction Industry Manufacturers Association, a powerful influence in the planning and construction of highways.

Dr. Symons

★ **Dr. George E. Symons** has reopened his full-time consulting office, at 86 Edgewood Ave., Larchmont, N.Y. He again offers his services as a consultant in sanitary engineering and as a consulting editor and writer of technical brochures, research reports, etc. Dr. Symons is now a special consultant to the Engineering Services Division of the USPHS and a trustee of the New York Section of AWWA.

★ Badger Meter Co. wins a $100 Award of Merit from MATERIAL IN DESIGN ENGINEERING for its Read-O-Matic system for remote reading of water meters.

★ **H. A. Harrison** becomes advertising-sales promotion manager, the Daybrook Hydraulic Division, Young Spring and Wire Corporation, at Bowling Green, Ohio. He comes from the Gradall Division, The Warner & Swasey Co., Cleveland.

Mr. Harrison

Mr. Henderson

★ **William Henderson**, mentioned a few issues back as an assistant advertising manager of Wallace & Tiernan Inc.'s Equipment Division, breaks into the news again. This time he is announced as promoted to advertising manager, effective June 15, 1959.

★ Gar Wood Industries promotions include **Harold H. Hippler,** to assistant director of truck and construction equipment sales; **D. J. Byrd** to general sales manager, truck equipment. **Del Hetrick** becomes tractor equipment sales manager.

★ **F. G. Hunt,** Cincinnati area sales manager, Armco Drainage & Metal Products, Inc., is promoted to senior sales engineer, at Middletown, Ohio headquarters.

★ A new $4 million plant will be built by The American Vitrified Products Co. of Cleveland in Somerville, N. J. Completely automated, this will be the first new clay pipe plant to be built in the East for many years.

★ Dorr-Oliver opens a new office in Winter Park, Fla., with **W. B. Williams** as manager.

Dr. Michaels

★ Doctor of Engineering is the honorary degree just awarded by his alma mater, South Dakota State College, to **Ernest E. Michaels,** president of the Chicago Bridge & Iron Co. Dr. Michaels, "Mike" to his Birmingham and Chicago friends, is also executive committee chairman and immediate past president of the Steel Plate Fabricators Association.

★ Yeomans Brothers' news includes the opening of a direct factory branch sales office in New York, in charge of **Frank J. Smith.** Yeomans has also named **Reid S. Parramore** regional sanitary engineer headquartering in Wilmington, Del., and **Eugene Smith** will be similarly placed at the new New York office.

★ Dog owner to Vet: "Doc, my dog is always chasing these small foreign cars." Vet: "Don't let that worry you. All dogs chase cars." Owner: "Yes but when my dog catches one of those little foreign jobs he takes it out in the back yard and buries it."

—Hy Gardner Calling

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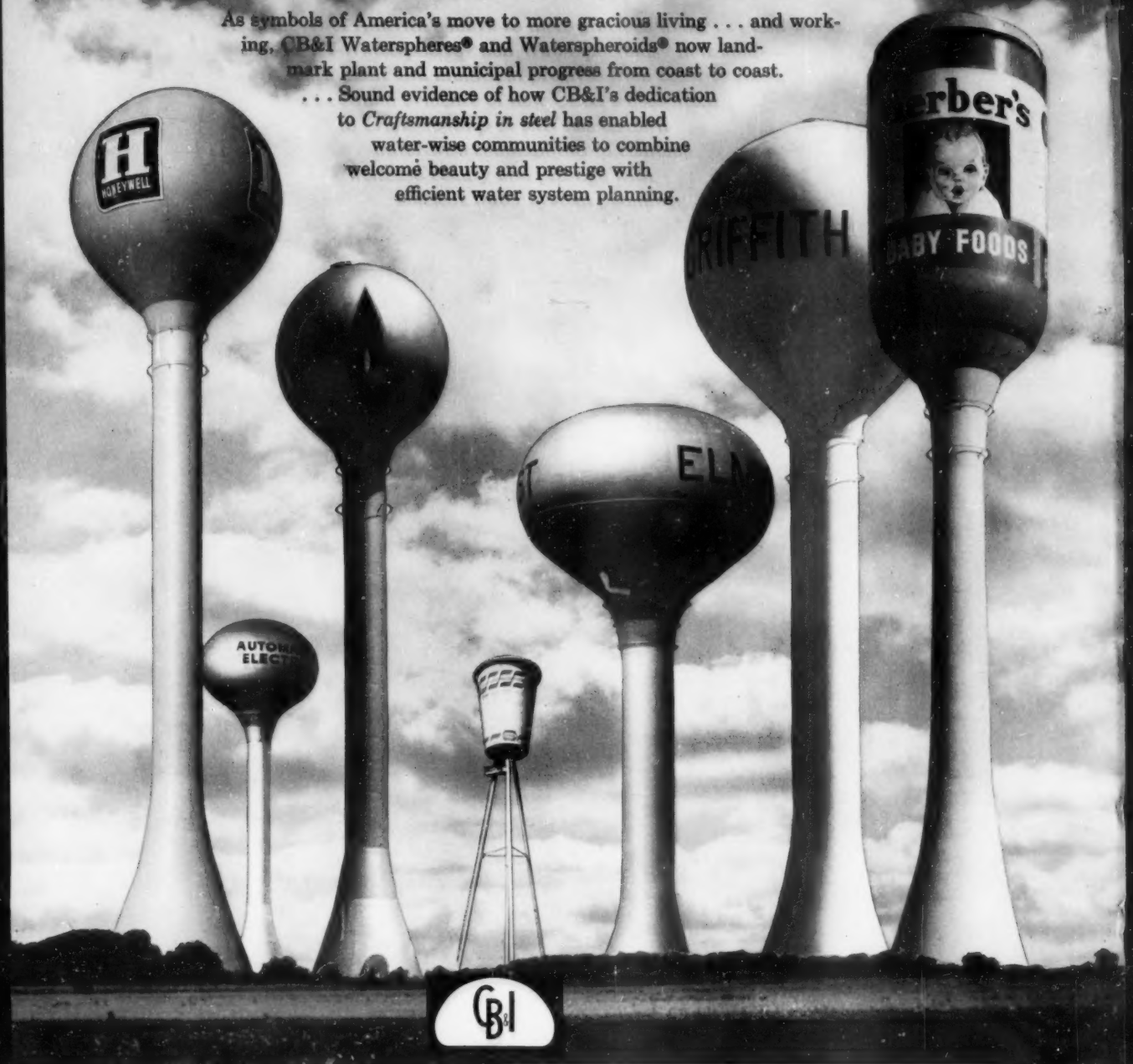

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A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-131.78

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